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**NORTH CAROLINA
AGRICULTURAL AND TECHNICAL
STATE UNIVERSITY**

Greensboro



**GRADUATE
SCHOOL
BULLETIN
1972-1973**

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GRADUATE
SCHOOL
BULLETIN
1972-1973

Graduate School Office
Room 200—Dudley

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GENERAL INFORMATION

Officers of Administration The University of North Carolina (Sixteen Constituent Institutions)

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The University of North Carolina was chartered in 1789 and opened its doors to students in 1795.

It became a multicampus University by act of the General Assembly of 1931 when The University of North Carolina at Chapel Hill, The North Carolina College for Women at Greensboro (now University of North Carolina at Greensboro) and The North Carolina State College of Agriculture and Engineering at Raleigh (now North Carolina State University at Raleigh) were merged.

Charlotte College was added as The University of North Carolina at Charlotte in 1965, and in 1969, Asheville-Biltmore College and Wilmington College became The University of North Carolina at Asheville and The University of North Carolina at Wilmington respectively.

The six-campus University was governed by a one-hundred member board of trustees elected by the legislature.

A revision of the North Carolina State Constitution adopted in November, 1970 included the following: "The General Assembly shall maintain a public system of higher education, comprising The University of North Carolina and such other institutions of higher education as the General Assembly may deem wise. The General Assembly shall provide for the selection of trustees of The University of North Carolina . . ." In slightly different language, this provision had been in the Constitution since 1868.

On October 30, 1971, the General Assembly, in special session merged the other ten state-supported senior institutions into the University as follows: Appalachian State University, East Carolina University, Elizabeth City State University, Fayetteville State University, North Carolina Agricultural and Technical State University, North Carolina Central University, North Carolina School of the Arts, Pembroke State University, Western Carolina University, and Winston-Salem State University. This merger became effective on July 1, 1972.

The Board of Trustees became the Board of Governors and the number was reduced to thirty-five members (thirty-two after July 1, 1973) elected by the General assembly. It is "responsible for the general determination, control, supervision, management, and governance of all affairs of the constituent institutions." However, each constituent institutions has a local board of

trustees of thirteen members, eight of whom are appointed by the Board of Governors, four by the Governor, and one, the elected president of the student body, whose principal powers are exercised under a delegation from the Board of Governors.

Each institution has its own faculty and student body, and each is headed by a chancellor as its chief administrative officer. Unified general policy and appropriate allocation of function are effected by the Board of Governors and by the President with other administrative officers of the University. The General Administrative Offices are located in Chapel Hill.

The chancellors of the constituent institutions are responsible to the President as the chief administrative and executive officer of The University of North Carolina.

NORTH CAROLINA AGRICULTURAL AND TECHNICAL
STATE UNIVERSITY

THE GRADUATE SCHOOL

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KARINE OLIVER, *Graduate School Representative*
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BURLEIGH C. WEBB, Ph.D., *Dean, School Agriculture*
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Professor of History, Ph.D., Indiana University

Bolinda Borah

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- Jimmy Lee Williams
Associate Professor, Ph.D., Indiana University
- Leo Williams, Jr.
Professor of Electrical Engineering, M.S., University of Illinois
- Ralph Wooden
Professor of Education, Ph.D., Ohio State University

HISTORY

Graduate education at North Carolina A. and T. State University was authorized by the North Carolina State Legislature in 1939. The authorization provided for training in agriculture, technology, applied science, and applied areas of study. An extension of the graduate program, approved by the General Assembly of North Carolina in 1957, provided for enlargement of the curriculum to include teacher education, as well as such other programs of a professional or occupational nature as might be approved by the North Carolina State Board of Higher Education.

On July 1, 1967, the legislature of North Carolina approved regional university status for the institution and renamed it North Carolina Agricultural and Technical State University. The graduate responsibilities of the institution as a regional university are to prepare teachers, supervisors, and administrators for the master's degree, to offer master's degree programs in the liberal arts and sciences, and to conduct such other programs as are deemed necessary to meet the needs of its constituency and of the state.

PURPOSE

The Graduate School coordinates advanced course offerings of all departments within the School of Agriculture, the School of Education, the School of Arts and Sciences, and the School of Engineering. Thus, the Graduate School offers advanced study for qualified individuals who wish to improve their competence for careers in professions related to agriculture, humanities, education, social studies, science, and technology. Such study of information and techniques is provided through curricula leading to the Master of Science degree and through institutes and workshops designed for those who are not candidates for a higher degree. Second, the Graduate School provides a foundation of knowledge and of techniques for those who wish to continue their education in doctoral programs at other institutions. Third, the Graduate School assumes the responsibility of encouraging scholarly research among students and faculty members.

It is expected that, while studying at this university, graduate students (1) will acquire special competence in at least one field of knowledge; (2) will develop further their ability to think independently and constructively; (3) will develop and demonstrate the ability to collect, organize, evaluate, and report facts which will enable them to make a scholarly contribution to knowledge about their discipline; and (4) will make new applications and adaptations of existing knowledge so as to contribute to their profession and to mankind.

ORGANIZATION

Graduate School Council

The Graduate School Council is responsible for formulating all academic policies and regulations affecting graduate students, graduate courses, and graduate curricula. The council consists of the chairmen of the departments offering concentrations in graduate studies, the deans of the schools offering graduate instruction, the Director of the Summer School, the Dean of Academic Affairs, the Director of Admissions, Registration and Records, and the Director of Teacher Education, five graduate students elected from the Graduate Club, and five faculty members selected from the graduate faculty. The Dean of the Graduate School serves as chairman of the council.

ADVISORY COMMITTEES OF THE GRADUATE SCHOOL

Standing committees of the Graduate School are organized to advise the council on matters pertaining to present policies, to evaluate existing and

proposed programs of study, and to process student petitions relating to academic matters. These committees are

Committee on Admissions and Retention
Committee on Curriculum
Committee on Publications
Committee on Rules and Policy

DEGREES GRANTED

The Graduate School of North Carolina A. and T. State University offers one degree, the Master of Science. This degree may be earned in the following fields:

1. Agricultural Education
2. Chemistry
3. Education
 - a. Administration
 - b. Audiovisual Media
 - c. Elementary Education
 - (1) Early Childhood
 - (2) Intermediate Education
 - d. Guidance
 - e. Reading
 - f. Secondary Education—(The student may select one of the following areas for certification purposes.)
 1. Art
 2. Biology
 3. Chemistry
 4. English
 5. French
 6. History
 7. Mathematics
 8. Physical Education
 9. Science
 10. Social Science
4. Engineering
5. Food and Nutrition
6. Industrial Education
 - a. Industrial Arts Education
 - b. Safety and Driver Education

Master of Science programs in Agricultural Education, Education and Industrial Education enable students to become eligible for the following certificates issued by the North Carolina State Department of Public Instruction:*

1. Graduate Elementary Certificate
2. Graduate Secondary Certificate
3. Principal's Certificate
4. School Counselor's Certificate

* Although the Department of Public Instruction requires a minimum score of 550 on the Common section of the National Teacher Examination for certification, this requirement is no longer demanded nor required for admission to candidacy by the A. and T. State University Graduate School. Those teachers planning to teach in North Carolina should arrange to take this examination. The current minimum score is 550 on each section.

ADMISSION AND OTHER INFORMATION

Admission to Graduate Study

All applicants for graduate study must have earned a bachelor's degree from a four-year college. Application forms must be submitted to the Graduate School Office with two transcripts of previous undergraduate and graduate studies. Processing of applications cannot be guaranteed unless they are received, with all supporting documents, in the Graduate Office at least fifteen days before a registration period. Applicants may be admitted to graduate studies unconditionally, provisionally, or as special students. Applicants are admitted without discrimination because of race, color, creed, or sex.

UNCONDITIONAL ADMISSION

To qualify for unconditional admission to graduate studies, an applicant must have earned an over-all average of 2.6 on a 4 point system (or 1.6 on a 3 point system) in his undergraduate studies. In addition, a student seeking a degree in Agricultural Education, Elementary Education, Industrial Education, or Secondary Education must possess, or be qualified to possess, a Class A Teaching Certificate in the area in which he wishes to concentrate his graduate studies. A student seeking a degree with concentration in Administration or Guidance must possess, or be qualified to possess, a Class A Teaching Certificate.

PROVISIONAL ADMISSION

An applicant may be admitted to graduate studies on a provisional basis if (1) he earned his baccalaureate degree from a non-accredited institution or (2) the record of his undergraduate preparation reveals deficiencies that can be removed near the beginning of his graduate study. A student admitted provisionally may be required to pass examinations to demonstrate his knowledge in specified areas, to take specified undergraduate courses to improve his background, or to demonstrate his competence for graduate work by earning no grades below "B" in his first nine hours of graduate work at this institution.

SPECIAL STUDENTS

Students not seeking a graduate degree at A. and T. may be admitted in order to take courses for self-improvement or for renewal of teaching certificate if said students meet standard Graduate School entrance requirements. If a student subsequently wishes to pursue a degree program, he must request an evaluation of his record. The Graduate School reserves the right to refuse to accept towards a degree program credits which the candidate earned while enrolled as a special student; in no circumstances may the student apply towards a degree program more than twelve semester hours earned as a special student.

Housing

The university maintains seven residence halls for women and three for men. A request for dormitory housing accommodation should be directed to the Dean of Students at least sixty days prior to the expected date of registration.

Food Services

The university provides food service for students at minimum cost. Two

cafeterias and a snack bar are operated at convenient locations on the campus. Students who live in the residence halls are required to eat in the cafeterias.

FINANCIAL ASSISTANCE

GRADUATE ASSISTANTS

A limited number of graduate assistantships are available to qualified individuals. The student is assigned to assist a professor or a department twenty hours per week for the duration of the assistantship. Some graduate assistants are assigned to teach freshman classes. Normally, a graduate assistant will be assigned to teach only one class per semester, but he may be assigned to teach a maximum of two. The assistantship offers a stipend in addition to the funds required for tuition, fees, books, and board and lodging expenses for residence on campus. Application for an assistantship must be made to the Dean of the Graduate School at least five months before fall registration. Only full-time graduate students are eligible.

OTHER ASSISTANCE

Funds, such as the National Defense Student Loan Fund, are available in limited quantity for students. Requests for information concerning these funds should be directed to the Graduate School.

EXPENSES

The fees charged to a full-time student carrying 12 or more semester hours of work are the same as those charged to full-time undergraduate students. For one academic year, a state resident should expect to pay \$524.50 which will cover tuition and course fees; this sum does not include room and board charges. Tuition and course fees for an out-of-state student carrying a full schedule will total \$2,073.50 for the academic year. Current room and board rates are \$382.00 per semester.

For the Summer, each in-state-student pays \$12.20 per credit hour for tuition and required fees; each out-of-state student pays \$28.80 per credit hour for tuition and required fees. Room and board are \$20.50 per week.

As student fees are subject to change without prior notice, it is suggested that the Cashier's Office be consulted for complete information concerning charges for full and part-time students.

SPECIAL FEES

Fee for processing application (required only for first application for graduate studies)	\$10.00
Late registration	5.00
Graduation fees:	
Diploma	15.00
Regalia	15.00
Transcript (after the first one)	1.00
Master's thesis binding fee	20.00

Auditing

To audit a course, a student must obtain permission from the Dean of the Graduate School and must submit the necessary forms during the registration period. A part-time student must pay all fees, including tuition, that would be charged to a student taking the course for credit. A full-time student is not required to pay any additional fees for auditing. A change from "credit" registration to "audit" will not be permitted after the close of the deadline date for withdrawing from a course. An auditor is not required to participate in class discussions, prepare assignments, or take examinations.

SCHEDULE OF DEADLINES

The Graduate School provides schedules of specific dates for completing various requirements for a degree program. These notices are not sent to individuals automatically, but may be found in the calendar of the Graduate School, available upon request.

REQUEST FOR GRADE REPORTS AND TRANSCRIPTS

The Office of Registration and Records is the official record-keeping office at the college. Requests for official statements regarding courses completed, grade reports, or transcripts should be directed to that office.

GENERAL REGULATIONS

Advising

Until he is assigned to an advisor after he has been accepted as a candidate in a degree program, a graduate student is advised by a member of the graduate faculty appointed by the Dean of the Graduate School. The student, however, should consult and follow the curriculum guide prepared for his area of concentration. Separate curriculum guide sheets are available in the office of the department offering the concentration. They may be secured also from the Graduate School Office.

"Special" students are advised by members of the graduate faculty appointed by the Dean of the Graduate School.

Class Loads

FULL-TIME STUDENTS

Class loads for the full-time student may range from 12 to 15 semester hours during a regular session of the academic year. The maximum load is 15 semester hours.

IN-SERVICE TEACHERS

The maximum load for a fully employed in-service teacher must not exceed six semester hours during any academic year.

UNIVERSITY STAFF

The maximum load for any fully employed member of the university faculty or staff will be six semester hours for the academic year.

Concurrent Registration in Other Institutions

A student registered in a degree program in this Graduate School may not enroll concurrently in another graduate school except upon permission, *secured in advance*, from the Dean of the Graduate School.

Grading System

Grades for graduate students are recorded as follows: A, excellent; B, average; C, below average; F, failure; S, work in progress (for courses in research); I, incomplete; W, withdrawal.

1. In order to earn a degree, a student must have a cumulative average of "B," (a grade point average of 3.0 on a system in which 1 hour of A earns 4 grade points).
2. A graduate student automatically goes on probation when his cumulative average falls below "B."
3. A student may be dropped from the degree program if he has not removed himself from probation after two successive terms as a full-time student.
4. A student may not repeat for credit a course in which he has earned a "C" or above.
5. A student may repeat a required course in which he has earned an "F." A student may not repeat the course more than once. If a student fails a second time, he is dismissed from the degree program.
6. All hours attempted in graduate courses and all grade points earned are included in the computation of the cumulative average of a graduate student.

7. A student who stops attending a course but fails to withdraw officially may be assigned a grade of "F."
8. All grades of "I" must be removed during the student's next term of residence.
9. A student may not count towards a degree program any course in which he has earned a grade of "F."

Note: The North Carolina State Department of Public Instruction does not accept towards renewal of certification any course in which a student has received a grade of "D" or "F."

Professional Education Requirements for Class A Teaching Certificate

The Department of Public Instruction of North Carolina requires 18 semester hours of credit in professional education courses for all applicants for Class A teaching certificates on the secondary level. These hours must include six credits in the sociological, historical, and philosophical foundations of American education; four credits in psychological foundations of education; two credits in curriculum, instructional procedures, materials, and methods; and six credits in student teaching. The applicant for a Class A teaching certificate on the intermediate elementary level must satisfy the requirements stated above and must also have two additional credits in psychological foundations of education and four additional credits in curriculum, materials, and methods.

In all graduate degree programs except those leading to a Master of Science in Chemistry, in Food and Nutrition, or the graduate degree program which leads to the Master of Science in Engineering, the student at A. and T. State University must hold a Class A certificate before he can be admitted to candidacy.

To provide for the student who enters graduate studies without the required credits in courses in education, the Graduate School offers the following program: Education 625, Education 500, (Principles and Curricula of Secondary Schools; Psychology 400. (Psychological Foundations of Education), Guidance 600, a three-semester hour course in methods of teaching, and six hours of student teaching. Education 500, the course in methods, and the student-teaching may be taken during the same semester. Education 500, Psy. 400, the methods course, and the student teaching offer undergraduate credit only.

The program stated above is intended for and required of all students pursuing degree programs in agricultural, industrial, or secondary education or in administration and supervision or guidance who have taken no undergraduate courses in professional education. Students who have earned some but not enough undergraduate credits in education and students without "A" certificates who are seeking graduate degrees in elementary education should consult with the Chairman of the Department of Education or the Dean of the Graduate School to work out a program to meet certification requirements.

While taking undergraduate courses in education and psychology to meet certification requirements, a student may enroll in graduate-level courses in his subject-matter area of concentration if he has completed the undergraduate requirements in that area.

Subject-matter Requirements for Class A Teaching Certificate

If a student has not completed sufficient undergraduate courses in a subject-matter field to hold a Class A certificate in that subject, he should consult with the chairman of the department offering that concentration. Together, they must work out a program to satisfy the undergraduate deficiencies by means of undergraduate courses or courses open to undergraduates and graduates.

REGULATIONS FOR A MASTER'S DEGREE

Admission to Candidacy for a Degree

Admission to graduate studies does not guarantee admission to candidacy for a degree. In order to be qualified as a candidate for a degree, a student must have a minimum overall average of 3.0 in at least nine semester hours of graduate work at A. and T., must have removed all deficiencies resulting from undergraduate preparation, and must have passed the Qualifying Essay. Some departments require additional qualifying examinations.

In order to be classified as a candidate for a Master of Science in Engineering degree, a student must have a minimum overall average of 3.0 in at least nine semester hours of approved graduate work at A. and T. and must have removed all deficiencies resulting from undergraduate preparation.

The following is the procedure for securing admission to candidacy:

1. The student secures application forms for admission to candidacy from the Graduate Office, fills them out, and returns them to that office. This step should be taken as soon as possible after the student has decided upon a degree program.

2. The Graduate Office processes the application, notifies the student of the action, and informs him of the time when the Qualifying Essay will next be administered.

3. The student may take the Qualifying Essay during his first term of residence in graduate studies. If a student fails the Qualifying Essay, he may take it a second time. After a second failure he must enroll in a prescribed English composition course (English 300 or 621) at this university and must earn a grade of "C" or above.

4. The Graduate Office informs the student of any qualifying examinations required by the department in which he is concentrating his studies.

5. After the student has completed at least nine semester hours of graduate study at the college, he becomes eligible for admission to candidacy. If, at that time, he has maintained an average of 3.0 in his graduate studies, has passed the Qualifying Essay and all departmental qualifying examinations, the Graduate School informs him that he has been admitted to candidacy and assigns him to an adviser in his field of concentration.

In order to be eligible for graduation during a term, a student must have been admitted to candidacy no less than fifteen days prior to the deadline for filing for graduation during that term.

Credit Requirements

The minimum credit requirements for a graduate degree are thirty semester hours for students in thesis and non-thesis programs. It is expected that a student can complete a program by studying full-time for an academic year and one additional summer term or by studying full-time during four nine-week summer sessions.

The minimum credit requirements for a Master of Science in Engineering are thirty semester hours for students who elect to take the thesis option and thirty-three semester hours for students who take the non-thesis option.

RESIDENCE REQUIREMENTS.

A minimum of three-fourths of the hours required for the degree must be earned in residence study at the university.

TIME LIMITATION

The graduate program must be completed within six successive calendar

years. Programs remaining incomplete after this time interval are subject to cancellation, revision, or special examination for out-dated work.

When the program of study is interrupted because the student has been drafted into the armed services, the time limit shall be extended for the length of time the student shall have been on active duty, if the candidate resumes graduate work no later than one year following his release from military service.

Course Levels

At the university, six-digit numbers are used to designate all course offerings. The last three digits indicate the classification level of the course. Courses numbered 600 through 699 are open to seniors and to graduate students. Courses numbered 700 through 799 are open only to graduate students. At least fifty percent of the courses counted in the work towards a Master's degree must be those open only to graduate students; that is, numbered 700 through 799.

Transfer of Credit

A maximum of six semester hours of graduate credit may be transferred from another graduate institution if (1) the work is acceptable as credit toward a comparable degree at the institution from which transfer is sought, and (2) the courses to be transferred are approved by the Dean of the Graduate School.

To request a transfer of credit, the student must complete an application in the Graduate School Office. It will be the applicant's responsibility to request from the appropriate institution(s) a statement certifying that the work is acceptable as credit toward a comparable degree. The transcript should then be sent to the Graduate School Office of A. and T. State University.

Final Comprehensive Examination

At least 45 days before a candidate expects to complete all work for the graduate degree, he should file in the Graduate Office an application for a final examination.

1. All graduate students are required to pass a written comprehensive examination in their area of specialty.
In the case of Engineering students, the School of Engineering will recommend to the graduate school whether or not this comprehensive examination will be oral or written.
2. Students pursuing a degree of M. S. in Education, subject-matter oriented, will take a comprehensive examination in two parts, subject-matter and professional education. The evaluation will be made by the faculties in the respective areas.
3. If a student fails a comprehensive examination twice, he must petition for a third examination. The petition is reviewed by a committee from the student's major concentration. A student who fails a third time is dismissed from the degree program.
4. Comprehensive examinations are to be scheduled by the departments, with the approval of the Graduate Office. A report of the student's performance must be submitted to the Graduate Office at least three weeks prior to Commencement.

Options For Degree Program

The student, in consultation with his adviser, selects the degree program to be followed. The adviser must notify the chairman of the department of the program plan which the candidate prefers to follow.

THESIS OPTION

In order for a student to pursue a thesis program, he must be recommended to the Dean of the Graduate School by his adviser and the chairman of the department in which he is concentrating his studies. The Graduate School must then approve the student as a candidate. The thesis program consists of thirty semester hours including the thesis. After receiving written approval to follow the thesis option, the candidate shall prepare and present the thesis proposal to the adviser. Upon the request of the adviser, the Dean of the Graduate School shall appoint a Thesis Proposal Committee and shall fix a time of meeting. Following acceptance of the proposal, the adviser must submit to the Dean of the Graduate School an approved copy of the proposal in its final form. Individuals who have been granted the privilege of following the thesis option are expected to demonstrate research competencies and to prepare a scholarly account of resulting data.

NON-THESIS OPTION

The non-thesis plan is offered to the candidate who may benefit more from a broader range of studies than from the preparation of a thesis. The program of study must consist of a minimum of 30 credit hours of prescribed courses.

Individuals who are following this plan must demonstrate their ability to conduct and to report the results of original research by preparing a paper as a part of the course Special Problems or Research or Seminar in the appropriate area.

THESIS OPTION (Master of Science in Engineering)

In order for a student to pursue a thesis program, he must be recommended to the Dean of the Graduate School by the Dean of the School of Engineering. The Graduate School must then approve the student as a candidate. The thesis program consists of thirty semester hours including the thesis. After receiving written approval to follow the thesis option, the candidate shall prepare and present the thesis proposal to the chairman of his Advisory Committee. Following acceptance of the proposal, an approved copy of the proposal in its final form must be submitted to the Dean of the Graduate School.

THE NON-THESIS OPTION (Master of Science in Engineering)

The non-thesis plan is offered to the candidate who may benefit more from a broader range of studies than from the preparation of a thesis. The program of study must consist of a minimum of 33 credit hours of prescribed courses.

Master's Thesis and Format

The following regulations for a Master's thesis and the format of the thesis:

1. A student writing a thesis must register for the course, Thesis, prior to the semester in which he expects to take the final examination.
2. Three typewritten copies of the completed thesis must be submitted to the Dean of the Graduate School, together with two copies of an abstract of the thesis. The abstract should be 400 to 500 words. Consult the Graduate School's calendar for deadline dates regarding submission of these manuscripts.
3. Additional information concerning the format is available in the Graduate School Office.

Application for Graduation

A candidate for graduation must file an application for graduation at least 30 days prior to the close of the session in which he expects to complete the requirements for the degree. A student secures the application forms from his adviser, who must approve the application before it is sent to the Graduate School Office. Failure to meet the deadline may result in delay of graduation for the candidate.

Graduate Record Examination

The Graduate Record Examination is required of all students who desire to become candidates for the Master of Science degree. Information concerning the time, place, and cost of the examination may be obtained from the office of the Dean of the Graduate School.

Administrative Policy Concerning Changes in Requirements for Students Enrolled in Degree Programs

Generally, a student is permitted to graduate according to the requirements specified either in the catalogue current during the year of his first application for candidacy or in the catalogue current during the year of his application for graduation. If more than six years pass between the student's application for candidacy and his application for graduation, the university reserves the right to require the student to satisfy the regulations in effect at the time of his application for graduation. In all instances, the Graduate School reserves the right to require students in programs in Agricultural Education, Education, or Industrial Education to satisfy the requirements specified by the North Carolina Department of Public Instruction at the time of the Student's completion of the requirements for the Master of Science degree.

Commencement

Diplomas are awarded only at the commencement exercises following the completion of all requirements for the degree. Attendance at Commencement is required of all graduating students unless individually excused by the Dean of the Graduate School.

Additional Regulations

Additional rules, regulations, and standards for each of the areas of graduate study appear in the appropriate sections of the catalogue. The prospective student should read such sections with care.

DEGREE PROGRAMS

A curriculum guide for each degree program can be obtained from the Graduate School Office. With approval of the Dean of the Graduate School, the Chairman of a department in which a student is concentrating may permit a student to substitute a course for one listed as required.

Master of Science in Agricultural Education

The Department of Agricultural Education offers work leading to the Master of Science degree in Agricultural Education.

REQUIREMENTS FOR ADMISSION TO A DEGREE PROGRAM

1. Baccalaureate degree from accredited undergraduate institution.
2. Class "A" teacher's certificate in Agricultural Education (or qualifications for such a certificate).
3. Satisfactory completion of all Graduate School requirements for admission to candidacy for a degree.
4. Failure to meet any of these criteria may necessitate rejection of the application or the requirement of additional undergraduate work.

GENERAL REQUIREMENTS FOR A DEGREE

A minimum of 30 semester hours are required. The degree is not conferred for a mere collection of credits. A well-balanced, unified, and complete program of study will be required. A student may meet the degree requirements by either full-time or part-time enrollment and by attendance in any combination of terms.

The student may follow a thesis or non-thesis program. Those candidates who do not write a thesis must present a suitable essay or investigative paper. Its nature and extent shall be determined by the department.

Courses in the major and minor areas will be selected on the basis of the individual's needs and interests. To qualify for the graduate certificate to teach in the public schools of North Carolina the candidate must complete 18 semester credits in subject matter agriculture. The candidate may concentrate in one subject matter area.

OTHER REQUIREMENTS

(a) Graduate Record Examination (Aptitude Test and Advanced Test in Education), (b) 3.0 grade point average for all graduate courses, (c) Final Comprehensive Examination in Agricultural Education.

Master of Science Degree in Chemistry

The Department of Chemistry offers the Master of Science degree in Chemistry. In addition to this program, the department provides instruction for those graduate students who wish to pursue a curriculum that can lead to a degree in Education with specialization in Chemistry. Individuals who desire to renew teaching certificates in the field may also enroll in certain courses in the department for this purpose.

REQUIREMENTS FOR ADMISSION TO A DEGREE PROGRAM

1. Baccalaureate degree from an accredited undergraduate institution.
2. Undergraduate major in Chemistry including one year of undergraduate Physical Chemistry and one year of Integral and Differential Calculus.
3. Satisfactory completion of all Graduate School requirements for admission to candidacy for a degree.
4. Any student, who is a rising junior in Chemistry, with a grade-point average of 3.0 in Chemistry and an overall grade-point average of 2.7.

Failure to meet any of these criteria may necessitate rejection of the application or the requirement of additional undergraduate work.

GENERAL REQUIREMENTS FOR A DEGREE, 30 SEMESTER HOURS, INCLUDING THESIS

1. *Required Courses*

Chemistry 611
Chemistry 722
Chemistry 641
Chemistry 701
Chemistry 732
Chemistry 799
Chemistry 702

(A maximum of 9 hrs. may be earned in 702)

2. *Other Requirements*

- a 2-8 sh. in electives
- b. GRE (Aptitude Test and Advanced Test in Chemistry). Scores must be submitted to the Graduate School Office before admission to the final examination can be granted.
- c. Satisfactory completion of an examination in German.
- d. Satisfactory presentation and defense of a thesis.
- e. One academic year of residence at A. and T.
- f. 3.0 grade point average for all graduate courses.
- g. Final comprehensive examination in Chemistry.
- h. Participation in seminar while in residence.

Candidates for the Master of Science in Chemistry who desire to teach in the public schools of North Carolina on a graduate certificate should study the course and examination requirements described for candidates for an M.S. in Education with concentration in Chemistry.

Master of Science Degree in Education

The School of Education offers the Master of Science in Education. This program is designed for the individual who wishes to seek a graduate certificate to teach or to serve in an administrative capacity in the public schools of North Carolina.

Areas of concentration included in this degree program are: 1) Audiovisual media, 2) Elementary Education, 3) Administration, 4) Guidance, 5) Secondary Education, 6) Supervision, and Reading.

REQUIREMENTS FOR ADMISSION TO A DEGREE PROGRAM

1. Baccalaureate degree from accredited undergraduate institution.
2. Class A certificate in area of concentration.
3. Satisfactory completion of all Graduate School requirements for admission to candidacy for a degree.

Audiovisual Media—30 s.h. required

- A. Non-Thesis Option: 30 semester hours required
 1. 3 s.h. in Curriculum and 3 s.h. in Historical and Philosophical Foundations of Education.
 2. Education 723, 766, 642, 644, 737, 738, 790 and Psy. 726.
- B. Thesis Option: 30 s.h. required
 1. 3 s.h. in Curriculum and 3 s.h. in Historical Foundations of Education.
 2. Education 642, 644, 723, 737, 738, 766, 791 and Psy. 726.
- C. Other Requirements:
 1. Master's Comprehensive in Education
 2. Master's Comprehensive in Audiovisual Media

Administration: 30 s.h. required

Students pursuing this area of concentration are not eligible for a graduate teaching certificate. This program is designed for those who are interested in qualifying for a principal's certificate.

1. *Courses*
 - a. Foundations in Education—3 hours
Psy. 726 or Ed. 701
 - b. Organization and Administration—6 hours
selected from:
Ed. 760
Ed. 761
Ed. 762
 - c. Curriculum, Instruction and Supervision—6 hours
selected from:
Ed. 720
Ed. 755
Ed. 756
 - d. Cognate Disciplines—6 hours
selected from:
Economics
Political Science
Sociology
Anthropology
 - e. Internship—Administrative Field Experience—3 hours
Ed. 769
 - f. Electives—6 hours
2. *Other Requirements*
 - a. GRE
 - b. Master's Comprehensive in Education and in Administration

Educational Administration Option for Supervisors

For the supervisor's certificate, the State of North Carolina requires five years' teaching and/or supervisory or administrative experience within the past eight years. A student will not be recommended for the North Carolina supervisor's certificate without the minimum five year's experience specified above.

- A. Requirements for Unconditional Admission
 1. Baccalaureate degree from accredited undergraduate institution.
 2. Overall average of 2.6 in undergraduate studies.
 3. Class A Certificate (or qualifications for such a certificate).
 4. Failure to meet any of these criteria may cause rejection of the application or may require additional undergraduate work to satisfy the requirements.
- B. Courses in Education and Psychology—15 semester hours
 1. Supervision—3 hours required
Education 755—Supervision of Instruction
Education 757—Problems in Supervision of the Elementary School
Education 758—Problems in High School Supervision
 2. Curriculum—3 hours required
Education 720—Curriculum Development
Education 721—Curriculum in the Elementary School
Education 722—Curriculum in the Secondary School
 3. The Nature of Learning and the Learning Process—3 hours required
Psychology 635—Educational Psychology and Learning
Psychology 726—Educational Psychology
Psychology 727—Child Growth and Development

4. Organization and Administration—3 hours required
Education 761—Administration of the Elementary School
Education 762—High School Administration
 5. Educational Research—3 hours required
Education 790—Seminar in Educational Problems
 - C. Required Courses in Subject Matter to qualify for issuance of the graduate teacher's certificate—early childhood or intermediate, or secondary—12-18 semester hours.
 - D. Electives—If 12 semester credit hours are used to satisfy C, 3 hours may be used as electives to meet the particular needs of the students.
 - E. Other requirements
 1. Qualifying Examination
 2. Graduate Record Examination
 3. Master's Comprehensive Examination in Education
 4. Master's Comprehensive Examination in Supervision
 5. Overall grade point average of 3.0 for all courses
- Total Number of Hours Required—30-33 (30 for those completing work for the supervisor's program at the Early Childhood Education level and the Intermediate Education level.

Early Childhood Education Curriculum (Grades K-3) 30 s.h. required

- A. NON-THESIS OPTION
 1. Courses
 - a. Ed. 790
 - b. 9 hours from the following areas appropriate to early childhood education
 - (1) Research
 - (2) The Nature of The Learner and The Learning Process
 - (3) Current Critical Issues in American Education
 - (4) Historical, Philosophical, and Sociological Foundations of Education
 - (5) Curriculum
 - c. 9 semester hours taken from English, Fine Arts (Art and Music) Health and Physical Education, Mathematics, Science and Social Science
 - d. 9 semester hours of electives
 2. Other Requirements
 - a. Graduate Record Examination (Aptitude and Advanced Test in Education)
 - b. 3.0 grade point average for all graduate courses
 - c. Final comprehensive examination in Elementary Education

Intermediate Education Curriculum (Grades 4-8)—30 s.h. required

- A. NON-THESIS OPTION
 1. Courses
 - a. Ed. 790
 - b. 9 hours from the following areas:
 - (1) Research
 - (2) The Nature of the Learner and the Learning Process
 - (3) Current Critical Issues in American Education
 - (4) Historical, Philosophical and Sociological Foundations of Education
 - (5) Curriculum, Supervision, etc.
 - (6) Purpose and Role of Elementary School
 - c. 18 semester hours taken from no more than two of the following disciplines: English, fine arts (art and music), health and education, mathematics, natural sciences, social sciences (government and history).

2. Other Requirements
 - a. Graduate Record Examination (Aptitude Test and Advanced Test in Education).
 - b. 3.0 grade point average for all graduate courses.
 - c. Final comprehensive examination in Elementary Education.

B. THESIS OPTION

1. Courses
 - a. Ed. 791
 - b. 9 hours from the following areas:
 - (1) Research
 - (2) The Nature of the Learner and the Learning Process
 - (3) Current Critical Issues in American Education
 - (4) Historical, Philosophical and Sociological Foundations of Education
 - (5) Curriculum, Supervision, etc.
 - (6) Purpose and Role of Elementary School
2. Other Requirements:
 - a. 18 s.h. in no more than two of the academic disciplines specified in the description of the non-thesis program.
 - b. Graduate Record Examination (Aptitude Test and Advanced Test in Education).
 - c. Comprehensive Examination in Elementary education

COUNSELOR-EDUCATION (Guidance) CURRICULUM: 31 s.h. required

This program is designed for the individual who seeks issuance of a School Counselor's Certificate and/or the Master's Degree. The prerequisites for admission to the program are: (1) a course in principles of guidance or an equivalent course (e.g., introduction to guidance, field of guidance, and so on, and (2) a course in statistics or educational and psychological measurement.

1. Required Courses S.H.

Education 701. Philosophy of Education	3
Education 720. Curriculum Development	3
or	3
Education 722. Curriculum in the Secondary School	3
Psychology 623. Personality Development	3
Psychology 726. Educational Psychology	3
Guidance 706. Organization and Administration of Guidance Services	2
Guidance 716. Techniques of Individual Analysis	2
Guidance 717. Educational and Occupational Information	3
Guidance 718. Introduction to Counseling	3
Guidance 705. Guidance Practicum	3
Courses in Anthropology, Economics, Intercultural Relations, and Sociology	6
2. An internship involving an extended period of continuous full-time experience must be completed by students who have not had previous teaching experience. The Internship will be completed during a regular school term, and will be concerned with providing knowledge about the total school program including curriculum and relationships with students, parents, teachers, administrators, and community referral agencies. (Guidance 714—3 semester hours)
3. Other Requirements
 - a. Graduate Record Examination (Aptitude and Advanced Test in Education).
 - b. 3.0 grade point average or better for graduate courses.
 - c. Final comprehensive examination in Guidance and in Education.

Reading Education Curriculum: 30 s.h. required

- A. *Option I.* This program leads to state graduate certification only for the Reading Teacher. For admission to this program the student must hold or qualify to hold the "Class A" Reading Teacher Certificate.
1. Required courses in Education—6 s.h.
Education 720, 721, 722 or 683
Psychology 726
 2. Courses in Reading—12 s.h. from the following
Education 640, 739, 740, 741, 742, 743
 3. Cognate areas—6 s.h. from the following
English 626, 627, 710, 754; Psy. 623, 728
Speech 630, Soc. 700.
 4. Other Required Course in Reading—3 s.h.
Education 744
 5. Electives—3 s.h.
 6. Other Requirements
Qualifying Examination
Master's Comprehensive Examination in Education
Master's Comprehensive Examination in Reading
Overall grade point average of 3.0 for all graduate courses.
- B. *Option II.* This program leads to State certification at both the "Class A" and "Graduate" levels for the Reading Teacher.
1. Required Courses in Education—6 s.h.
Education 720, 721, 722 or 683
Psychology 726
 2. Courses in Reading—15 hours from the following
Education 630, 635, 636, 637, 638, 639, 640, 739, 740, 741, 742
 3. Other Required Course in Reading—3 s.h.
Education 744
 4. Courses in Cognate area—6 s.h.
English 626 (required if a similar course has not been satisfactorily completed before admission); English 710, 754, Psychology 623, 728, Speech 630, Soc. 700
 5. Other Requirements
Qualifying Examination
Master's Comprehensive in Education
Master's Comprehensive in Reading
Overall grade point average of 3.0 for all graduate courses.

Safety and Driver Education: 30 s.h. required

The program of Safety and Driver Education prepares qualified individuals for careers as safety and driver education teachers, school district safety supervisors, professional personnel for leadership roles at state and federal levels.

1. Required Courses
 - a. Six hours from the following areas in Education
 - (1) The Nature of the Learner and the Learning Process
 - (2) Current Critical Issues in American Education
 - (3) Historical, Philosophical, and Sociological Foundations of Education
 - (4) Curriculum, Supervision, etc.
 - b. Eighteen hours in Safety and Driver Education
(I.E. 750 and 751 are required courses)
 - c. Three hours of electives
 - d. Three hours of thesis (Safety and Driver Education)

2. Other Requirements
 - a. A thesis
 - b. A minimum 3.0 grade point average for all graduate courses
 - c. Final comprehensive examination in Education and Safety and Driver Education.
 - d. Qualifying Examination

Secondary Education Curriculum: 30 s.h. required

Candidates following the secondary education program must select one of the following academic areas of concentration: (1) Art, (2) Biology, (3) Chemistry, (4) English, (5) French, (6) Health and Physical Education, (7) Mathematics, (8) History, (9) Science, or (10) Social Science,

1. Courses
 - a. Non-thesis Option: 6 hours from the following areas:
 - (1) Research
 - (2) The Nature of the Learner and the Learning Process
 - (3) Current Critical Issues in American Education
 - (4) Historical, Philosophical and Sociological Foundations of Education
 - (5) Curriculum, Supervision, etc.
 - b. Thesis Option: 6 hours from the following areas:
 - (1) Research
 - (2) The Nature of the Learner and the Learning Process
 - (3) Current Critical Issues in American Education
 - (4) Historical, Philosophical and Sociological Foundations of Education
 - (5) Curriculum, Supervision, etc.
2. Other Requirements
 - a. Students in a non-thesis program may take either Education 790 (Seminar) or a seminar in the area of concentration. Students in a thesis program may take Education 791 (Thesis) or a thesis research course offered in the area of concentration. In all instances, the decision is to be made in consultation with the adviser.
 - b. Graduate Record Examination (Aptitude Test and Advanced Test in area of concentration).
 - c. 3.0 grade point average for all graduate courses
 - d. Final comprehensive examination in Education and area of concentration.

For details of the specific requirements in each area of concentration, see the descriptive material for the department offering the concentration.

Master of Science in Engineering

The School of Engineering, through its graduate division, offers a program of advanced study leading to the degree of Master of Science in Engineering. Formal instruction is offered in several areas of engineering such as electrical systems, engineering mechanics, industrial operations, mechanical systems, structural engineering, and structural mechanics. However, the instructional areas are not limited to the abovementioned areas. The programs reflect interdisciplinary emphases and are coordinated by the student's Advisory Committee in such a way as to meet the professional needs and experiences of the individual candidate.

REQUIREMENTS FOR ADMISSION TO A DEGREE PROGRAM

1. Applicants must be accepted into the Graduate School, and approval of qualifications must be made by the Dean of the School of Engineering.
2. Successful completion of a program which is to be worked out by the student's Advisory Committee and approved by the Engineering Grad-

uate Committee. At least 20 semester hours must be in engineering courses. Elective courses may be selected from mathematics, chemistry, or other appropriate disciplines.

3. Completing a minimum of 30 semester hours including a thesis of 6 semester hours, or completing a minimum of 33 semester hours.
4. B Average in course work.
5. Passing a final comprehensive examination.

Master of Science Degree in Food and Nutrition

The Department of Home Economics offers the Master of Science degree in Food and Nutrition. This program provides training and experience for careers in food research, nutrition research, nutrition education, food testing, food demonstration, food journalism, college teaching, and clinical nutrition.

REQUIREMENTS FOR ADMISSION TO A DEGREE PROGRAM

1. Baccalaureate degree from accredited undergraduate institution.
2. The undergraduate program should have included one year of general chemistry; one year of organic chemistry; courses in qualitative analysis and biochemistry; and introductory courses in foods and nutrition, diet therapy, and experimental cookery.
3. Satisfactory completion of all Graduate School requirements for admission to candidacy for a degree, with the exception of the National Teachers' Examination, which is not required for candidates for a Master of Science in Food and nutrition.
4. Failure to meet any of these criteria may necessitate rejection of the application or the requirement of additional undergraduate work.
5. Prior to being admitted as a candidate to a degree program, the student must pass a qualifying examination in his major.

GENERAL REQUIREMENTS FOR A DEGREE: 30 SEMESTER HOURS INCLUDING THESIS

1. Program

The program is worked out by the student's adviser in consultation with the chairman of the Department of Home Economics and Approved by the Graduate School. At least twenty hours must be in courses in Food and Nutrition. Electives or a minor may be selected from journalism, statistics, chemistry, biology, and other appropriate areas.

2. Other Requirements

- a. GRE (Aptitude Test and appropriate Advanced Test).
- b. Satisfactory presentation and defense of a thesis.
- c. 3.0 grade point average for all graduate courses.
- d. Final comprehensive examination in Food and Nutrition.

Master of Science Degree in Industrial Education

The Department of Industrial Education offers the Master of Science in Industrial Education with options in Industrial Arts and in Trade and Industrial Education.

REQUIREMENTS FOR ADMISSION TO A DEGREE PROGRAM

1. Baccalaureate degree from accredited undergraduate institution.
2. Class A certificate in Industrial Arts or Industrial Education.
3. Satisfactory completion of all Graduate School requirements for admission to candidacy for a degree.
4. Failure to meet any of these criteria may necessitate rejection of the application or the requirement of additional undergraduate work.

GENERAL REQUIREMENTS FOR A DEGREE

Industrial Arts Curriculum: 30 semester hours required

1. Required Courses
 - a. I.E. 765
 - b. 9 s.h. from the following areas:
 - (1) Research
 - (2) The Nature of the Learner and the Learning Process
 - (3) Current critical issues in American Education
 - (4) Historical, Philosophical and Sociological Foundations of Education
 - (5) Curriculum, Supervision
 - c. 12 s.h. in Industrial Arts laboratory courses to include I.A. 717 or 718
 - d. Thesis Option: Ed. 791 or I.Ed. 769
or
 - e. Non-Thesis Option: Ed. 790 or I.Ed 768
 - f. Electives: 3 s.h.
2. Other Requirements
 - a. Graduate Record Examination (Aptitude Test and Advanced Test in Education).
 - b. 3.0 grade point average for all graduate courses.
 - c. Final comprehensive examination in Industrial Arts and Industrial Education.

Trade and Industrial Education Curriculum: 30 semester hours required

1. See requirements for Industrial Arts
2. Substitute 12 hours of Industrial Education non laboratory courses for 1-c above.

AGRICULTURAL EDUCATION

A. P. Bell, Charman

Office: 242 Carver Hall

The Department of Agricultural Education offers programs leading to the Master of Science Degree. The programs are designed to meet the needs of individual students and emphasize the professional improvement of teachers and professional workers in related areas. They provide advanced preparation for employment in administration, supervision, teacher education, and research in agricultural education and related fields.

AGRICULTURAL EDUCATION

Advanced Undergraduate and Graduate

- 110-601. Adult Education in Occupational Education.** Credit 3(3-0)
(Formerly Ag-Ed 1271)

A study of the principles and problems of organizing and conducting programs for adults. Emphasis is given to the principles of conducting organized instruction.

- 110-602. The Principles of Agricultural Education.** Credit 3(3-0)
(Formerly Ag-Ed 1272)

A study of the principles and practices in agricultural education revealed by research and new trends.

- 110-603. Problem Teaching in Agricultural Education.** Credit 3(3-0)
(Formerly Ag-Ed 1273)

Practice in setting up problems for teaching unit courses in vocational agriculture.

- 110-604. Public Relations in Vocational Agriculture.** Credit 3(3-0)
(Formerly Ag-Ed 1274)

Principles and practices of organizing, developing, and implementing public relations for promoting local programs.

- 110-605. Guidance and Group Instruction in Occupational Education.** Credit 3(3-0)
(Formerly Ag-Ed 1275)

Guidance and group instruction applied to agricultural occupations and other problems of students in vocational education.

- 110-606. Cooperative Work-Study Programs** Credit 3(3-0)

Principles, theories, organization, and administration of cooperative work experience programs.

- 110-607. Environmental Education**

Principles and practices of understanding the environment and the interrelated complexities of the environment. The course will include a study of agricultural occupations related to the environment and materials that need to be developed for use by high school teachers of agriculture and other professional workers.

For Graduate Students Only

- 110-700. Seminar in Agricultural Education.** Credit 1(1-0)
(formerly Ag-Ed 1285)

A review of current problems and practices in the field of agricultural education.

110-702. Methods and Techniques of Public Relations. Credit 3(3-0)
(Formerly Ag-Ed 1286)

A study of the means and methods of promoting and publicizing local programs in agriculture.

110-703. Research in Agricultural Education

Methods of procedures in investigation and experimentation in education, accompanied by critical examination of studies made in agricultural education. A research problem is developed under the supervision of the staff.

110-704. Philosophy of Occupational Education. Credit 3(3-0)
(Formerly Ag-Ed 1288)

This course deals with the underlying philosophy and basic principles of vocational education. Emphasis is placed upon the factors contributing to the nature, purpose, scope, organization, and administration of vocational education in agriculture.

110-705. Recent Developments and Trends in Agricultural Education.
(Formerly Ag-Ed 1289) Credit 3(3-0)

The course includes an intensive treatment of the various subject matter fields to keep teachers up-to-date technically as well as professionally. It is designed to cover the developments and trends in agricultural education.

110-750. Community Problems. Credit 3(3-0)
(Formerly Ag-Ed 1290)

A study of the common problems of the community that relate to agriculture and related areas and of solutions for these problems.

110-751. Methods and Techniques of Supervision in Agricultural Education.
(Formerly Ag-Ed 1291) Credit 3(3-0)

The course includes the common methods and techniques that should be used in organizing and supervising agricultural education on state and local levels. In addition, the course will include supervision of student teaching.

110-752. Administration and Supervision. Credit 3(3-0)
(Formerly Ag-Ed 1292)

A study of administrative and supervisory problems; the practices and policies of local, state, and federal agencies dealing with administration and supervision of vocational agriculture.

110-753. Program Planning. Credit 3(3-0)
(Formerly Ag-Ed 1293)

Consideration is given to the community as a unit for program planning in agricultural education. Special emphasis on collecting and interpreting basic data formulating objectives, developing and evaluating community programs.

110-754. History of Agricultural Education. Credit 3(3-0)
(Formerly Ag-Ed 1294)

Historical development, social and philosophical foundations, and current status in relation to the total vocational education program. Special attention is given to agricultural education as it developed in the United States.

110-760. Thesis Research in Agricultural Education. Credit 3 sem. hrs.

ANIMAL SCIENCE
T. Brewer, Acting Chairman
Office: Ward Hall

ANIMAL SCIENCE

Advanced Undergraduate and Graduate

- 120-601. Principles of Animal Nutrition.** Credit 3(3-0)
(Formerly A. H. 1371)

A study of fundamentals of modern animal nutrition including classification of nutrients, their general metabolism and role in productive functions. (Prerequisite: A.H. 404.)

- 120-602. Animal Science Seminar.** Credit 1(1-0)
(Formerly A. H. 1372)

A review and discussion of current literature pertaining to all phases of animal husbandry.

- 120-603. Advanced Livestock Management.** Credit 3(3-0)
(Formerly A. H. 1373)

Special work in problems dealing with feeding, breeding, and management in the production of beef cattle, sheep and swine.

For Graduate Students Only

- 120-690. Selection of Meat and Meat Products.** Credit 3(2-2)
(Formerly A. H. 1385)

Identification, grading, and cutting of meats.

- 120-702. Advanced Livestock Marketing** Credit 3(3-0)

Survey of recent research and developments in the methods of marketing livestock, and problems involved in the marketing process.

- 120-703. Advanced Livestock Production** Credit 3(2-2)

Review of research relating to various phases of livestock production; fitting the livestock enterprise into the whole farm system. Special attention to overall economic operation.

DAIRY SCIENCE

Advanced Undergraduate and Graduate

- 120-604. Dairy Seminar I.** Credit 1(1-0)
(Formerly Dairy Husb. 1374)

Research on subjects relating to the dairy industry and methods of preparing and presenting such research.

- 120-605. Dairy Seminar II.** Credit 1(1-0)

A continuation of 604. (Formerly Dairy Husb. 1375)

- 120-606. Special Problems.** Credit 3(3-0)
(Formerly Dairy Husb. 1376)

Work along special lines in which a student may be interested, given largely by the project method for individuals either in Dairy Manufacturing or Dairy Production. (Prerequisite—three advanced courses in dairying.)

For Graduate Students Only

- 120-705. **Advanced Dairy Farm Management.** Credit 3(3-0)
(Formerly D. H. 1385)

A study of dairy farm operations; rations; feeding and care of the herd; selecting and grading the herd; herd sires; testing for production; barns and equipment; marketing; cost of production.

POULTRY SCIENCE

For Advanced Undergraduates and Graduates

- 120-608. **Poultry Seminar.** Credit 1(1-0)
(Formerly Poultry Husb. 1378)

Special articles and reports on subjects relating to the poultry industry will be assigned each student; round-table discussion.

- 120-609. **Poultry Anatomy and Physiology** Credit 3(2-2)
(Formerly Poultry Husb. 1379)

A course which deals with the structure and function of tissues, organs, and systems of the domestic fowl. (Prerequisite: Poultry Husb. 501.)

For Graduate Students Only

- 120-690 **Special Problems in Poultry.** Credit 3(1-4)
(Formerly Poultry Husb. 1389)

Work along special lines in which a student may be interested, given largely by the project method for individuals in Poultry Husbandry. (Prerequisite: three advanced courses in poultry.)

- 120-780. **Poultry Research** Credit 3(0-6)
(Formerly P. H. 1394)

ART

LeRoy F. Holmes, Chairman
Office: Frazier Hall

Requirements for Admission to a Degree Program.

In addition to the general requirements specified in the description of the degree program in Education, a student wishing to be accepted as a candidate for the degree, Master of Science in Education with a concentration in art, must hold or be qualified to hold a "Class A" teaching certificate in art. The areas covered should be: painting, ceramics, or sculpture, design, art history, and crafts. Each applicant for admission is required to submit a portfolio of his work.

A student who fails to meet these qualifications will be expected to satisfy these requirements by enrolling in appropriate undergraduate courses before beginning his graduate studies in art.

Requirements for a Degree

Non-thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science degree in Education, the student must complete the following: Art 720, 721, 722, and nine additional hours of art selected from the following courses: 602, 603, 604, 605, 606, 607, and 608. He

must also take 6 semester hours of electives in art, education or related fields.

Thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science degree in Education, the student must complete the following: Art 720, 721, 722, and nine additional hours of art selected from the following courses: 602, 603, 604, 605, 606, 607, and 608. He must also take 3 semester hours of electives in art, education or related fields, and thesis.

Advanced Undergraduate and Graduate

- 211-600. Public School Art.** Credit 3(3-0)
(Formerly Art 3270)

Study of materials, methods, and procedures in teaching art in public schools. Special emphasis is placed on selection and organization of materials, seasonal projects, lesson plans.

- 211-602. Seminar in Art History.** Credit 3(3-0)
(Formerly Art 3272)

Investigation in depth of the background influences which condition stylistic changes in art forms by analyzing and interpreting works of representative personalities.

- 211-603. Studio Techniques.** Credit 3(0-6)
(Formerly Art 3272)

Demonstrations that illustrate and emphasize the technical potentials of varied media. These techniques are analyzed and discussed as a point of departure for individual expression.

- 211-604. Ceramics Workshop** Credit 3(0-6)
(Formerly Art 3274)

Advanced studio problems and projects in ceramics with emphasis on independent creative work. The student is given opportunity for original research and is encouraged to work toward the development of a personal style in the perfection of technique.

- 211-605. Printmaking.** Credit 3(0-6)
(Formerly Art 3275)

Investigation of traditional and experimental methods in printmaking. Advanced studio problems in woodcut etching, lithography, and serigraphy.

- 211-606. Sculpture.** Credit 3(0-6)
(Formerly Art 3276)

Further study of sculpture with an expansion of techniques. Individual problems for advanced students.

- 211-607. Project Seminar.** Credit 2(0-4)
(Formerly Art 3277)

Advanced specialized studies in creative painting, design, and sculpture. By means of discussion and suggestions, this seminar intends to solve various problems which might arise in each work. Prerequisite: Consent of the instructor.

- 211-608. Arts and Crafts.** Credit 3(0-6)
(Formerly Art 3278)

Creative experimentation with a variety of materials, tools, and processes: projects in wood, metal, jewelry making, wood and metal construction, fabric design, leather craft, puppet making, and paper sculpture.

For Graduates Only

- 211-720. Methods of Criticism, Interpretation, and Research** Credit 3(3-0)
(Formerly 3285)

Investigation of the theories of art, methods of criticism and their application.

- 211-721. Research and Analysis.** Credit 3(2-2)
(Formerly 3286)

Individual projects relating to contemporary art in Europe and America. Two hours lecture and two hours studio or conference per week.

- 211-722. Seminar in Art Education.** Credit 3(2-2)
(Formerly 3287)

Special problems in the teaching and supervision of art in the public schools; laboratory experiences in a variety of media; observations, readings, discussions and lectures.

BIOLOGY

Artis P. Graves, Chairman

Office: 102 Barnes Hall

Requirements for Admission to a Degree Program

In addition to the general requirements specified in the description of the degree programs in Education, a student wishing to be accepted as a candidate for the degree Master of Science in Education with concentration in Biology must hold or be qualified to hold a class A teaching certificate in Biology.

Requirements for a Degree

Non-thesis Option: 30 s.h. required.

In addition to courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following courses or their equivalent:

1. Zoology 661, 662, 663, 766, 767, and 704 (or 760-761).
2. 6 s.h. of electives in education, biology, or subjects related to biology.

Thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following courses or their equivalent:

1. Zoology 661, 662, 663, 766, 767, and 862 or 863.
2. 3 hours of electives in education, biology, or related fields.
3. Thesis.

For Advanced Undergraduates and Graduates

GENERAL SCIENCE

- 221-600. General Science for Elementary School Teachers.** Credit 3(3-0)
(Formerly Gen. Sci. 1570)

This course will consider some of the fundamental principles of the life and physical sciences in an integrated manner in the light of present society needs.

BOTANY

- 221-640. Plant Biology.** Credit 3(2-2)
(Formerly Bot. 1572)

A presentation of fundamental botanical concepts to broaden the background of high school biology teachers. Bacteria, fungi, and other microscopic plants will be considered as well as certain higher forms of plants. The course will consist of lectures, laboratory projects, and field trips.

- 221-642. Special Problems in Botany.** Credit 3(2-2)
(Formerly Bot. 1573)

Open to advanced students in botany for investigation of specific problems. Prerequisite: Biology 140 or 640.

ZOOLOGY

- 221-660. Special Problems in Zoology.** Credit 3(2-2)
(Formerly Biol. 1574)

Open to students qualified to do research in zoology.

- 221-661. Mammalian Biology.** Credit 3(3-0)
(Formerly Biol. 1575)

Study of the evolutionary history, classification, adaptation and variation of representative mammals with special emphasis on the prenatal variations in prototherian, metatherian and eutherian types. Prerequisites: 140 and 160.

- 221-662. Biology of Sex.** Credit 3(3-0)
(Formerly Biol. 1576)

Lectures on the origin and development of the germ cells and reproductive systems in selected animal forms. Prerequisite: Zoology 160 or equivalent.

- 221-663. Cytology.** Credit 3(3-0)
(Formerly Biol. 1577)

Study of the cell with lectures and periodic student reports on modern advances in cellular biology. Prerequisite: Zoology 465 or special consent of instructor.

- 221-664. Histo-Chemical Technique.** Credit 3(1-4)
(Formerly Biol. 1578)

Designed to develop skills in the preparation of cells, tissues and organs for microscopic observation and study. Prerequisite: Zoology 160.

- 221-665. Nature Study.** Credit 3(3-0)
(Formerly Biol. 1579)

A study of diversified organisms, their habits, life histories, defenses, sex relationships, periodic activities, and economic values; designed to acquaint the student with fundamental knowledge that should lead to a fuller appreciation of nature.

- 221-666. Experimental Embryology.** Credit 3(1-4)
(Formerly Biol. 1580)

A comprehensive lecture-seminar course covering the more recent literature on experimental embryology and developmental physiology. Experimental studies treating amphibian, chick and rodent development are designed as laboratory projects. Prerequisite: Biol. 561 or equivalent.

- 221-667. Animal Biology.** Credit 3(2-2)
(Formerly Biol. 1581)

A lecture-laboratory course stressing fundamental concepts and principles of biology with the aim of strengthening the background of high school teachers. Emphasis is placed on the principles of animal origin, structure, function, development, and ecological relationships.

For Graduate Students Only

BOTANY

- 221-740. Essentials of Plant Anatomy.** Credit 3(2-2)
(Formerly Botany 1585)

A study of the growth, development and organization of roots, stems, leaves, and reproductive organs of higher plants. Lectures, discussions, field trips, and the laboratories are employed in the presentation of this course.

- 221-741. Applied Plant Ecology.** Credit 3(2-2)
(Formerly Botany 1586)

A study of the relations of plants to their environment with emphasis on climate and soil factors influencing their structure, behavior and distribution. Prerequisite: Biology 640, 740 or equivalent.

- 221-742. Physiology of Vascular Plants.** Credit 3(2-2)
(Formerly 1587)

Selected topics on the physiology of higher plants. Relationships of light quality, intensity, and periodicity to plant growth and reproduction: photosynthesis, and photoperiodism. Chemical control of growth and reproduction, and the general aspect of plant metabolism. Lectures, conferences, laboratory work and field studies of higher plant ecology.

- 221-743. Development Plant Morphology** Credit 3(2-2)
(Formerly 5586)

Growth and differentiation from a cellular viewpoint, with emphasis on quantitative description and experimental study of development phenomena.

- 221-744. Plant Nutrition** Credit 3(2-2)
(Formerly 5587)

A study of the subcellular organization of plants, inorganic and organic metabolism and respiration.

ZOOLOGY

- 221-762. Applied Invertebrate Zoology** Credit 3(2-2)
(Formerly Zoology 1590)

A study of the lower groups of animals, especially insects, and their economic importance to the southeastern region. Lectures, field trips, and experimental work with local animals are stressed, as well as factors affecting growth, development and behavior. Prerequisite: Biology 667 or equivalent.

- 221-763. Fundamentals of Vertebrate Morphology** Credit 3(2-2)
(Formerly Zoology 1591)

A study of the morphological evolution of the chordate animals from a comparative aspect, with lecture-demonstrations of dissected organ systems of the frog and cat. Reference to man is made to give this course a human approach. Prerequisite: Biology 667 or equivalent.

- 221-764. Basic Protozoology** Credit 3(2-2)
(Formerly Zoology 1592)

A study of the biology of free-living and parasitic protozoa with special

emphasis on structure, behavior, life histories, and classification. Special attention will be given to free-living forms from such local animals as fish, frogs, and wild rodents. Prerequisite: Biology 667.

221-765. Introductory Experimental Zoology Credit 3(2-2)
(Formerly Zoology 1593)

Studies of fertilization, breeding habits, regeneration, growth and differentiation of certain invertebrates and vertebrates from the experimental approach. Emphasis will be placed on laboratory procedures on the frog and the chick.

221-766. Invertebrate Biology for Elementary and Secondary School Teachers Credit 3(3-0)
(Formerly Zoology 1594)

A study of representative invertebrate groups with emphasis on origin, structure, function, classification, and ecological relationships.

221-767. Genetics and Inheritance for the Secondary School Teacher Credit 3(2-2)
(Formerly 1595)

A study of mendelian and molecular genetics with emphasis on organic evolution, linkage, mutation of genes and of chromosomes, population mechanics and the relation between genes and environment in development. Laboratory experiments with drosophila and maize.

221-768. Functional Invertebrate Zoology Credit 3(1-4)
(Formerly 1596)

Special topics in Invertebrate Zoology to be selected for detailed study with laboratory observations made on certain forms.

221-769. Cellular Physiology. Credit 4(2-4)
(Formerly 1598)

The physio-chemical aspect of protoplasm including permeability of surface tension, cellular metabolism, and other measurable properties of living cells.

221-860. Parasitology. Credit 3(2-2)
(Formerly 5585)

The study of the theoretical and practical aspects of parasitism, taxonomy, physiology and immunology of animal parasites.

221-861. Advanced Genetics. Credit 3(2-2)
(Formerly 5588)

The effects of chemical agents in the environment upon inheritance. Reports from the literature chiefly upon chemical mutations. Laboratory experiments on the chemical induction of crossing over.

221-862. Research in Botany. 3 Credit Hours
(Formerly 5592)

221-863. Research in Zoology. 3 Credit Hours
(Formerly 5593)

BIOLOGY

221-700. Environmental Biology. Credit 3(2-2)
(Formerly 5589)

Problems, concepts and interpretations of relations between organisms and the environment; and analysis of environmental factors on growth, reproduction, distribution, and competition between organisms.

221-701. Biological Seminar. Credit 1(1-0)
(Formerly 5590)

The presentation and defense of original research, consideration of special topics in biology and current literature.

221-702. Biological Seminar. Credit 1(1-0)
(Formerly 5591)

A continuation of Biology 701.

221-703. Experimental Methods in Biology. Credit 3(1-4)
(Formerly 1597)

Laboratory techniques for androgenesis, parabiosis, parthenogenesis, transplantations, grafting and other experimental techniques for recent biological research.

221-704. Seminar in Biology. Credit 3(2-2)
(Formerly 1599)

Lectures, reports and laboratory procedures will be presented by student participants, staff and guest lectures on modern techniques and recent developments of selected biological problems. The nature and scope of the problem and the methods employed to study them will be varied to suit the needs and background of the student.

CHEMISTRY

Walter W. Sullivan, Acting Chairman

Office: Hines Hall Annex

The Department of Chemistry in its graduate division:

1. Provides a program of study that leads either to the M.S. degree in Chemistry or the M.S. degree in Education with concentration in Chemistry.
2. Provides formal instruction in depth in several areas of Chemistry (Inorganic, Organic, Physical and Biochemistry).
3. Provides the opportunity for the development of creativity in special problems and research activities.
4. Provides the opportunity for the students to progress toward academic maturity by engaging in group discussions, developing and presenting seminar topics, writing up research finding, and by presenting an approved thesis to the Graduate School (the latter is required of all candidates for the M.S. degree in Chemistry).

MASTER OF SCIENCE IN CHEMISTRY

Requirements for admission to candidacy and for the degree are listed earlier in this catalogue in the description of the degree programs.

"Rising juniors, who qualify for the Graduate Program, should refer to the Undergraduate Bulletin for further information and program requirements."

MASTER OF SCIENCE IN EDUCATION WITH CONCENTRATION IN CHEMISTRY

**Academic-year Program (intended for students enrolled for a year of residence)
Requirements for Admission to a Degree Program**

In addition to the general requirements specified in the description of the degree programs in Education, a student wishing to be accepted as a candidate for the degree Master of Science in Education with concentration on Chemistry must hold or be qualified to hold a class A teaching certificate in

Chemistry and must have completed, on the undergraduate level, a course in Physical Chemistry and a course in Integral and Differential Calculus (or the equivalent).

Requirements for a Degree

Non-thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science degree in Education, the student must complete the following:

1. Chemistry 611, 722, 641, 732, and 701.
2. 5 additional s.h. in Chemistry, including a special problems course in Inorganic, Analytical, Organic, or Physical Chemistry.
3. 2 hours of electives.

Thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science degree in Education, the student must complete the following:

1. Chemistry 611, 722, 641, 732, and 701.
2. A thesis in Chemistry or Education
3. 4 hours of electives

For Advanced Undergraduates and Graduates

223-610. Inorganic Synthesis. Credit 2(1-3)
(Formerly Chem. 1670)

Discussion of theoretical principles of synthesis and development of manipulative skills in the synthesis of inorganic substances. Prerequisites: One year of Organic Chemistry; one semester of Quantitative Analysis.

223-611. Advanced Inorganic Chemistry. Credit 4(4-0)
(Formerly Chem. 1671)

A course in the theoretical approach to the systematization of Inorganic Chemistry. Prerequisites: Chemistry 441, 442 concurrent.

223-624. Qualitative Organic Chemistry. Credit 5(3-6)
(Formerly Chem. 1776)

A course in the systematic identification of organic compounds. Prerequisite: One year of Organic Chemistry.

223-631. Electroanalytical Chemistry Credit 3(3-0)
(Formerly Chem. 1781)

A study of the theory and practice of polarography, Chronopotentiometry, potential sweep chronoampereometry and electrodeposition. The theory of diffusion and electrode kinetics will also be discussed along with the factors which influence rate processes, the double layer, adsorption and catalytic reactions. Prerequisite: Chemistry 431.

223-641. Radiochemistry. Credit 4(3-3)
(Formerly Chem. 1782)

A study of the fundamental concepts, processes, and applications of nuclear chemistry, including natural and artificial radioactivity, sources and chemistry of the radioelements. Open to advanced majors and others with sufficient background in Chemistry and Physics. Prerequisite: Chemistry 442 or Physics 406.

223-642. Radioisotope Techniques and Applications. Credit 2(1-3)
(Formerly Chem. 1783)

The techniques of measuring and handling radioisotopes and their use in Chemistry, Biology, and other fields. Open to majors and non-majors. Prerequisite: Chemistry 102. Prerequisite: Chemistry 222.

223-643. Introduction to Quantum Mechanics. Credit 4(4-0)

Non-relativistic wave mechanics and its application to simple systems by means of the operator formulation. Prerequisites: Math 222, Physics 222, and Chemistry 442 prior or concurrent.

223-651. General Biochemistry. Credit 5(3-6)
(Formerly Chem. 1780)

A study of modern Biochemistry. The course emphasizes chemical kinetics and energetics associated with biological reactions and includes a study of carbohydrates, lipids, proteins, vitamins, nucleic acids, hormones, photosynthesis, and respiration. Prerequisites: Chemistry 431 and 442.

For Graduate Students Only

INORGANIC CHEMISTRY

223-711. Structural Inorganic Chemistry. Credit 2(2-0)
(Formerly Chem. 1785)

A study of the stereochemistry of inorganic substances; the relationship of structure to properties; and a discussion of experimental methods. Prerequisites: Chem. 611 and 643.

223-716. Selected Topics in Inorganic Chemistry Credit 2(2-0)
(Formerly Chem. 1686)

A lecture course on advanced topics of Inorganic Chemistry. Prerequisite: Chemistry 611 or permission of the instructor.

ORGANIC CHEMISTRY

223-721. Elements of Organic Chemistry. Credit 3(2-3)
(Formerly Chem. 1690)

A systematic study of the classes of aliphatic and aromatic compounds and individual examples of each. Structure, nomenclature, synthesis, and characteristic reactions will be considered. Illustration of the familiarity of organic substances in everyday life will be included. In the laboratory, preparation and characterization reactions will be performed.

223-722. Advanced Organic Chemistry. Credit 4(4-0)
(Formerly Chem. 1691)

Recent developments in the areas of structural theory, stereochemistry, molecular rearrangement and mechanism of reactions of selected classes of organic compounds. Prerequisite: One year of Organic Chemistry or Chemistry 721.

223-723. Organic Reactions. Credit 2(2-0)
(Formerly Chem. 1692)

An advanced treatment of organic reactions designed to give the student a working knowledge of the scope and limitations of the important synthetic methods of Organic Chemistry. Prerequisite: Chemistry 722.

223-726. Selected Topics in Organic Chemistry. Credit 2(2-0)
(Formerly Chem. 1693)

A lecture course on advanced topics in Organic Chemistry.

223-727. Organic Preparations.
(Formerly Chem. 1694)

Credit 1-2(0-2 to 4)

An advanced laboratory course. Emphasis is placed on the preparation and purification of more complex organic compounds. Prerequisite: One year of Organic Chemistry.

BIOCHEMISTRY

223-756. Selected Topics in Biochemistry
(Formerly Chem. 1695)

Credit 2(2-0)

A lecture course on advanced topics in Biochemistry.

ANALYTICAL CHEMISTRY

223-731. Modern Analytical Chemistry
(Formerly Chem. 1787)

Credit 3(2-3)

The theoretical bases of Analytical Chemistry are presented in detail. In the laboratory, these principles together with a knowledge of chemical properties are used to identify substances and estimate quantities in unknown samples.

223-732. Advanced Analytical Chemistry
(Formerly Chem. 1788)

Credit 4(4-0)

A lecture course in which the theoretical bases of Analytical Chemistry and their application in analysis will be reviewed with greater depth than is possible in the customary undergraduate courses. Equilibrium processes, including proton and electron transfer reactions and matter-energy interactions, will be considered. Prerequisite: One year of Analytical Chemistry or Chemistry 731.

223-736. Selected Topics in Analytical Chemistry
(Formerly Chem. 1786)

Credit 2(2-0)

A lecture course on advanced topics in Analytical Chemistry.

PHYSICAL CHEMISTRY

223-741. Principles of Physical Chemistry I
(Formerly Chem. 1789)

Credit 4(3-3)

A review of the fundamental principles of Physical Chemistry, including the derivation of the more important equations and their application to the solution of problems. Prerequisite: Mathematics 606 or 222.

223-742. Principles of Physical Chemistry II
(Formerly Chem. 1790)

Credit 4(3-3)

A continuation of Chem. 741. May be taken concurrently with Chem. 741.

223-743. Chemical Thermodynamics
(Formerly Chem. 1791)

Credit 4(4-0)

An advanced course in which the laws of thermodynamics will be considered in their application to chemical processes. Prerequisite: Chemistry 442 or 742.

223-744. Chemical Spectroscopy
(Formerly Chem. 1792)

Credit 3(2-3)

An advanced course in which the principles and applications of spectroscopy will be considered. Prerequisite: Chemistry 442 or 742.

223-746. Selected Topics in Physical Chemistry Credit 2(2-0)
(Formerly Chem. 1795)

A lecture course on advanced topics in Physical Chemistry. Prerequisite: Chemistry 442 or 742.

223-748. Colloid Chemistry Credit 2(2-0)
(Formerly Chem. 1794)

A study of the types of colloidal systems and the fundamental principles governing their preparation and behavior. Prerequisite: Chemistry 442 or 742.

223-749. Chemical Kinetics Credit 4(4-0)
(Formerly Chem. 1793)

A study of theory of rate processes; application to the study of reaction mechanisms. Prerequisites: Mathematics 222 and Chemistry 442 or 742.

RESEARCH AND SPECIAL PROBLEMS

223-701. Seminar Credit 1(1-0)
(Formerly Chem. 1098)

Presentation and discussion of library or laboratory research problems.

223-702. Chemical Research Credit 2-5(0-6 to 15)
(Formerly Chem. 1085, 1086 and 1087)

A course designed to permit qualified students to do original research in chemistry under the supervision of a senior staff member. May be taken for credit more than once.

223-715. Special Problems in Inorganic Chemistry Credit 2-4(0-6 to 12)
(Formerly Chem. 1088 and 1089)

A laboratory course designed to introduce the student to the techniques of chemical research by solving minor problems in Inorganic Chemistry. May be taken for credit more than once.

223-725. Special Problems in Organic Chemistry Credit 2-4(0-6 to 12)
(Formerly Chem. 1090 and 1091)

A laboratory course designed to introduce the student to the techniques of chemical research by solving minor problems in Organic Chemistry. May be taken for credit more than once.

223-735. Special Problems in Analytical Chemistry Credit 2-4(0-6 to 12)
(Formerly Chem. 1092 and 1093)

A laboratory course designed to introduce the student to the techniques of chemical research by solving minor problems in Analytical Chemistry. May be taken for credit more than once.

223-745. Special Problems in Physical Chemistry Credit 2-4(0-6 to 12)
(Formerly Chem. 1094 and 1095)

A laboratory course designed to introduce the student to the techniques of chemical research by solving minor problems in Physical Chemistry. May be taken for credit more than once.

223-755. Special Problems in Biochemistry Credit 2-4(0-6 to 12)

A laboratory course designed to introduce the student to the techniques of chemical research by solving minor problems in Biochemistry. May be taken for credit more than once.

THESIS RESEARCH

223-799. Thesis Research
(Formerly Chem. 1799)

Credit 3 Sem. Hrs

ECONOMICS **Sidney Evans, Chairman** **Office: 202 Hodgkin**

For Advanced Undergraduates and Graduates

ECONOMICS

Advanced Undergraduate and Graduate

231-610. Consumer Economics Credit 3(3-0)

This course is designed to acquaint the student with the nature, scope and tools of Consumer Economics. It is particularly oriented to minority groups, thus focusing on the economic choices currently facing groups with rising incomes and aspirations. The course will consider the economic choices faced by consumers in maximizing satisfaction with limited means.

231-615. Economic, Political and Social Aspects of the Black Experience Credit 3(3-0)

A study of the political, economic and social tools of current public policy treating the subject of race in America. The course will examine the economic and social conditions of income inequality and explore the national commitment to equal opportunity. Special emphasis will be placed on illustrations from North Carolina and adjacent states.

AGRICULTURAL ECONOMICS

231-630. Southern Resources in a Changing Economy—a Seminar
(Formerly Ag. Ec. 1170) Credit 3(3-0)

Trends and the formulation of economic and social problems in the South and particularly in North Carolina; labor and capital mobility, agricultural as compared with the industrial, the problem of underemployment, and important phases of current economic development. Prerequisites: Economics 301, Sociology 203 or Ag. Econ. 330.

231-632. Agri-Business Policy Credit 3(3-0)
(Formerly Ag. Ec. 1171)

The place of agri-business in the national and international economy; the impact of public policy on the industry. An analysis of policy as it relates to price support programs, finance, trade and resource development. Prerequisite: Ag. Econ. 330.

231-634. Commodity Marketing Problems Credit 3(3-0)
(Formerly Ag. Ec. 1172)

Methods, grades, values, price, cost, and governmental policy. Not more than two commodities will be studied in any one quarter. Selection of commodities and emphasis on problem areas will be made on the basis of current need; commodities studied will be cotton, tobacco, fruits and vegetables, and grains. Prerequisite: Consent of the Department Chairman.

231-636. Seminar in Marketing Farm Products Credit 3(3-0)
(Formerly Ag. Ec. 1173)

Discussion, reports, consultation and research efforts which throw light on marketing problems of low income farmers in North Carolina, including national and international importance of locally grown products such as tobacco and cotton. Prerequisite: Consent of the Department Chairman.

231-638. Special Problems in Agricultural Economics Credit 3(1-2)
(Formerly Ag. Ec. 1174)

Designed for students who desire to work out special problems in the field of agricultural economics; problem definition, formulation and investigation. Prerequisite: Consent of the Department Chairman.

231-640. Agri-Business Management Credit 3(2-2)
(Formerly Ag. Ec. 1175)

Methods of research, plans, organization, and the application of management principles. Part of the student's time will be spent in consultation with Agri-business firms. Prerequisite: Consent of the Department Chairman.

231-642. Seminar in Agricultural Economics Credit 2(2-0)
(Formerly Ag. Ec. 1176)

Discussion reports and an appraisal of current literature on agricultural problems. Prerequisite: Consent of the Department Chairman.

231-644. Statistical Methods in Agricultural Economics I Credit 3(2-2)
(Formerly Ag. Ec. 1177)

Statistical methods with special applications to agricultural problems. The statistical table, ratios, percentages, bar charts, line charts, and frequency distribution are used as analytical tools. Prerequisites: Ag. Econ. 330, Econ. 310, or Sociology 203.

231-646. Statistical Methods in Agricultural Economics II Credit 3(2-2)
(Formerly Ag. Ec. 1178)

Statistical methods with special applications to agricultural problems. The time series analysis, sampling theory, analysis of variance, and simple correlation are used as analytical tools. This course is a continuation of Ag. Econ. 644.

231-648. Appraisal and Finance of Agri-Business Firms Credit 3(3-0)
(Formerly Ag. Ec. 1179)

Principles of land evaluation, appraisal and taxation. The role of credit in a money economy, classification of credit, principles underlying the economic use of credit. The role of the government in the field of credit.

For Graduate Students Only

ECONOMICS

231-601. Economic Understanding, 2876 Credit 3(3-0)
(Formerly Ec. 2876)

An analysis of the institutional organization and functions of the American economy. Special references will be made to the state of North Carolina. A prerequisite for all graduate students who had no undergraduate courses in economics and wish to take the graduate courses in economics.

231-701. Labor and Industrial Relations Credit 3(3-0)
(Formerly Ec. 5882)

Two important sectors of the economy are examined—labor and management. Historical, public and governmental influences are studied.

231-705. Government Economic Problems Credit 3(3-0)
(Formerly Ec. 5883)

This course will consider the growth of public expenditures and revenues and debts of the United States; theories of taxation and tax incidence; and the effects of public expenditures and taxes on economic growth.

231-710. Economic Development and Resource Use Credit 3(3-0)

This course deals with resource and economic development in the domestic economy and also a comparison drawn among developed, developing and undeveloped societies.

231-720. Development of Economic Systems Credit 3(3-0)

An analytical approach to the study of various economic systems, how these systems developed and how they are organized to carry on economic activity.

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EDUCATION

Dorothy Prince, Chairman
Office: 201 Hodgkin Hall

For Advanced Undergraduates and Graduates

EDUCATION

310-602. Extramural Studies I Credit 1-3

Off-campus experiences with educational programs of agencies, organizations, institutions, or businesses which give first-hand experiences with youth and adults and aspects of education. Project report and evaluation. (By permission of Department.)

310-610. Organization and Administration of School Media Centers Credit 3(3-0)

The administrative organizational procedures including functions, organization and selection policies, program planning, and management of school media centers.

310-625. Theory of American Public Education Credit 3(3-0)
(Formerly Education 2180)

An examination of the philosophical recourse, objectives, historical influences, social organization, administration, support, and control of public education in the United States.

310-626. History of American Education Credit 3(3-0)
(Formerly Education 2184)

A study of the historical development of education in the United States, emphasizing educational concepts and practices as they relate to political, social, and cultural developments in the growth of a system of public education.

310-627. The Afro-American Experience in American Education Credit 3(3-0)
(Formerly Education 2181)

Lectures, discussions, and research on the Afro-American in American education including the struggle for literacy, contributions of Afro-Americans to theory, philosophy and practice of education in the public and private schools, and higher education. Traces the development of school desegregation, its problems and plans.

310-628. Seminar and Practicum in Urban Education Credit 3(1-4)

A synthesis of practical experiences, ideas and issues pertinent to more effective teaching in urban areas.

310-630. Foundations in Reading Instruction Credit 3(3-0)
(Formerly Education 2179)

Basic reading courses; consideration of the broad field of reading—its goals and nature; factors affecting its growth; sequential development of skills, attitudes and interests, types of reading approaches, organization and materials in teaching the fundamentals of reading.

310-635. Teaching Reading Through the Primary Years Credit 3(3-0)

Methods, materials, and techniques used in reading instruction for pre-school through grade three. An examination of learning, the teaching of reading, and curriculum experiences and procedures for developing reading skills.

**310-636. Methods and Materials in Teaching Reading
in the Elementary School** Credit 3(3-0)
(Formerly 2171)

The application of principles of learning and child development to the teaching of reading and the related language arts. Methods and approaches to the teaching of reading in the elementary school, including phonics, developmental measures, informal testing procedures, and the construction and utilization of instructional materials.

310-637. Teaching Reading in the Secondary School Credit 3(3-0)
(Formerly 2178)

Nature of a developmental reading program; initiating and organizing high school reading program; the reading curriculum including reading in the content subjects, critical reading, procedures and techniques, and corrective and remedial aspects.

310-638. Classroom Diagnosis in Reading Instruction Credit 3(3-0)

Methods, techniques, and materials used in the diagnosis of reading problems in the kindergarten-primary area through the intermediate level. Attention upon the pupil and the interpretation of physiological, psychological, sociological, and educational factors affecting learning to read. Opportunity for identification analysis interpretation on, and strategies for fulfilling the reading needs of all pupils. Prerequisite: Psychology 541.

310-639. Reading Practicum Credit 3(0-6)

Application of methods, materials and professional practices relevant to teaching pupils at the intermediate level. Provisions for participation in and teaching of reading, diagnosis, learning, and materials, student teaching in a public school. Prerequisite: 12 credit hours in reading.

310-640. Reading for the Atypical Learner Credit 3(3-0)

Attention to the gifted child, the able retarded, the slow learner, the disadvantaged, and the linguistically different child. Special interest groups will be formed for investigative reports.

310-641. Teaching the Culturally Disadvantaged Learner Credit 3(3-0)
(Formerly 2271)

Psychological and sociological influences on culturally deprived learners and their development. Emphasis on the experiential needs of the culturally deprived learner and special teaching techniques for these learners. A con-

sideration of groups of American Indians, Negroes, Puerto Ricans, urban poor, rural poor, mountain whites, and migrant workers who may be culturally deprived.

310-642. Preparation of Audiovisual Materials Credit 3(3-0)
(Formerly 2176)

The development and application of basic skills in the production of graphic and audio teaching materials as media of communications. Preparing instructional materials as they relate to educational programs.

310-644. Utilization of Audiovisual Media Credit 3(2-2)

A consideration of the improvement of instruction through the use of Audiovisual Media. Includes learning and communications theory, selection, utilization, evaluation, systems approach, and the integration of audiovisual materials, equipment, and resources in the implementation of the curriculum and educational programs; the design and care of instructional materials, locating source materials; and the operation and care of related equipment.

310-650. Book Selection and Related Materials for Children Credit 3(3-0)

A study of children's literature with emphasis on aids and criteria for selection of books and other materials for pre-school through late childhood ages, storytelling, and an investigation of reading interests.

310-651. Book Selection and Related Materials for Young People Credit 3(3-0)
(Formerly 2076)

A consideration of literature, reading interests, and non-book materials for young people.

310-652. Foundations of Librarianship Credit 3(3-0)
(Formerly Education 2078)

A history of books, libraries, and current trends in librarianship.

310-653. Building Library Collections Credit 3(3-0)
(Formerly 2077)

Criteria for evaluating and selecting library materials, devising and maintaining an acquisition program.

310-660. Introduction to Exceptional Children Credit 3(3-0)
(Formerly 2372)

An overview of the education needs of exceptional or "different" children in the regular classroom situation; emphasis placed on classroom techniques known to be most helpful to children having hearing losses, speech disorders, visual problems, emotional, social handicaps and intelligence deviations, including slow-learners and gifted children. An introduction to the area of special education. Designed for classroom teachers.

310-661. Psychology of the Exceptional Child Credit 3(3-0)
(Formerly 2373)

An analysis of psychological factors affecting identification and development of mentally retarded children, physically handicapped children, and emotionally maladjusted children.

310-663. Measurement and Evaluation in Special Education Credit 3(2-2)
(Formerly 2375)

The selection, administration, and interpretation of individual tests; intensive study of problems in testing exceptional and extremely deviate children; consideration to measurement and evaluation of children that are

mentally, physically, and emotionally or socially handicapped. Emphasis upon the selection and use of group tests of intelligence and the interpretation of their results.

- 310-664. Materials, Methods, and Problems in Teaching
Mentally Retarded Children** Credit 3(2-2)
(Formerly 2377)

Basic organization of programs for the education of the mentally retarded; classification and testing of mental defectives; curriculum development and principles of teaching intellectually slow children. Attention is also given to the provision of opportunities for observing and working with children who have been classified as mentally retarded. Prerequisites: Special Education 660, 661, 662, and 663.

- 310-665. Practicum in Special Education** Credit 3(0-6)

Observation, participation, and teaching in an educational program for the mentally retarded.

- 310-670. Introduction to Adult Education** Credit 3(3-0)
(Formerly Education 2172)

The history, philosophy, and general organization and administrative problems of adult education. Prerequisite: a course in educational psychology.

- 310-671. Methods in Adult Education** Credit 3(2-2)
(Formerly Education 2173)

Methods of informal instruction, group leadership, conference planning, and techniques in handling various issues of interest to adults. For persons preparing to conduct adult education programs as well as those preparing to serve as instructors or leaders in the public schools and/or in various agencies serving adults. Prerequisite: Education 670.

- 310-683. Curriculum in Early Childhood**
(Also Child Development 614) Credit 3(3-0)

Curriculum experiences and program planning appropriate to nursery and kindergarten education.

- 310-684. Methods in the Preschool and Primary Grades** Credit 3(3-0)
(Formerly Ed. 2079)

Administration, principles, practices, methods, and resources in the organization of preschool and primary programs. An interdisciplinary and team approach. Observation for teaching styles and strategies.

For Graduate Students Only

EDUCATION

- 310-700. Introduction to Graduate Study** Credit 2(2-0)
(Formerly 2294)

Methods of research, interpretation of printed research data, and use of bibliographical tools.

- 310-701. Philosophy of Education** Credit 3(3-0)
(Formerly 2185)

A critical study of and a philosophic approach to educational problems. The nature and aims of education in a democratic society, relation of the individual to society, interests and disciplines, play and work, freedom and control, subject matter and method.

310-702. Readings in Modern Philosophy of Education Credit 3(3-0)

Study and analysis of selected topics in philosophy of education.

310-703. Educational Sociology Credit 3(3-0)
(Formerly 2195)

The school as a social institution, school-community relations, social control of education, and structure of school society.

310-710. Methods and Techniques of Research Credit 3(3-0)
(Formerly 2189)

Careful analysis and study of research problems; techniques and methods of approach.

310-711. Educational Statistics Credit 3(3-0)
(Formerly 2299)

The essential vocabulary, concepts, and techniques of descriptive statistics as applied to problems in education and psychology.

310-720. Curriculum Development Credit 3(3-0)
(Formerly 2085)

Basic concepts and modern trends in curriculum development for grades K-12; the purposes, objectives, and programs of the school; the relationship of allied subject areas to curriculum development; the relationship of the community; and the contributions and interrelationships of administrative personnel, other personnel, and lay persons to curriculum development.

310-721. Curriculum in the Elementary School Credit 3(3-0)
(Formerly 2296)

Basic concepts of curriculum and curriculum development with attention to curriculum issues and to desirable instructional practices in the elementary school.

310-722. Curriculum in the Secondary School Credit 3(3-0)
(Formerly 2187)

Curriculum development, functions of the secondary school, types of curricula; emphasis on trends, issues, and innovations.

310-723. Principles of Teaching Credit 3(3-0)
(Formerly 2295)

A study of the status of teaching as a profession in the United States; teacher obligations, responsibilities and opportunities for leadership in the classroom and community with special emphasis on principles of and procedures in teaching.

310-724. Problems and Trends in Teaching Science Credit 3(3-0)
(Formerly 2193)

Attention to major problems of the high school teacher of science. Lesson plans, assignments, tests, etc., constructed and administered by each student in class. Audiovisual materials, demonstration and laboratory techniques carried out.

310-725. Problems and Trends in Teaching Social Science Credit 3(3-0)
(Formerly 2192)

Survey of major problems in the broad field of social studies and consideration of improved ways of presentation and class economy, including lesson plans, assignments, audiovisual materials, and other means of facilitating learning.

310-726. Workshop in Methods of Teaching Language Arts Credit 3(3-0)
(Formerly 2291)

A consideration of instruction in language arts, literature, grammar, composition. Designed for teachers in the elementary and junior high schools.

310-727. Workshop in Methods of Teaching Modern Mathematics for Junior and Senior High School Teachers Credit 3(3-0)
(Formerly 2087)

Model lesson plans, use of educational media, geometric and trigonometric devices, Truth Tables, and intuitive and formal logic in the teaching of modern mathematics in the junior and senior high school.

310-728. Workshop in Methods of Teaching Modern Mathematics in Elementary Schools Credit 3(3-0)
(Formerly 2290)

Discussion of concepts concerning the teaching of modern mathematics. Prerequisite: Math. 625.

310-736. Workshop in Audiovisual Media Credit 3(1-4)
(Formerly 2191)

An exploration of recent materials, methods, and techniques and the development of skills and competencies in audiovisual communications. Demonstrations and presentations by specialists, audiovisual representatives, and other persons skilled in the use of these media; projects, field trips, and discussions based upon the problems and needs of the participants.

310-737. Organization and Administration of Audiovisual Programs Credit 3(3-0)
(Formerly 2190)

Planning, organizing, and administering audiovisual programs. The philosophical, psychological, and curricular bases for an audiovisual program; and equipment; and the planning of facilities and budget for a program. (If a student has had no previous course in audiovisual communication, permission of the instructor is required.)

310-738. Audiovisual Media Program Internship Credit 3(3-6)

An internship designed to provide the student with on-the-job training and direct experience relating to his needs and interests in operating, organizing, and administering an audiovisual media program. Prerequisites: 642, 735, and 737.

310-739. Reading in the Content Areas Credit 3(3-0)

Attention on reading, problems and procedures and materials for improving reading in the social studies, science, English, mathematics, foreign language, home economics and other fields.

310-740. Problems in the Improvement of Reading Credit 3(3-0)
(Formerly 2094)

Study of current problems, issues, trends and approaches in the teaching of reading including investigations of underlying principles of reading improvement; coverage of appraisal techniques, materials and procedures, innovative and corrective measures; and application of research data and literature. Prerequisite: A previous graduate course in reading.

310-751. Advanced Diagnosis in Reading Instruction Credit 3(3-0)

The diagnosis and treatment of reading difficulties. Study and interpretation of selected tests useful in understanding and analyzing physiological,

psychological, sociological and educational factors related to reading difficulties. Case studies and group diagnosis.

310-742. Organization and Administration of Reading Programs Credit 3(3-0)

Administrative acts requisite to the creation and guidance of a well-balanced, school-wide reading program. For all school personnel who are in a position to make administrative decisions regarding the school reading program.

310-743. Advanced Practicum in Reading Credit 3(0-6)

Actual experiences with youth and teachers in professional activities.

310-744. Seminar and Research in Reading Credit 3(3-0)

Evaluation of recent research concerning findings, approaches, innovations, and organization of reading instructions. Selected topics for reports and research projects. Independent study of selected topics or experimentation. Prerequisite: 24 semester credit hours in graduate courses.

310-745. Advanced Reference and Bibliography Credit 3(3-0)
(Formerly 2293)

Special reference problems, methods and materials for school libraries; includes cooperative aspects of librarianship and the development of bibliographies.

310-746. Principles and Problems in Cataloguing and Classification Credit 3(3-0)
(Formerly 2298)

Methods of obtaining and organizing materials for effective use in school libraries. A study of descriptive and subject cataloguing and handling of audiovisual materials.

310-755. Supervision of Instruction Credit 3(3-0)
(Formerly 2086)

Modern concepts and techniques of supervision; the roles of the supervisor, principal, and consultant in curriculum development; and the procedures, problems, and materials of supervising and improving instruction in grades 1-12.

310-756. Supervision of Student Teachers Credit 3(3-0)
(Formerly 2285)

A basic professional course for classroom teachers, principals, and supervisors who serve in an official capacity directing the field-laboratory experiences of student teachers.

310-757. Problems in Supervision of the Elementary School Credit 3(3-0)
(Formerly 2197)

The nature, theory and practice of supervision, and the supervisor's role in improvement of instruction.

310-758. Problems in High School Supervision Credit 3(3-0)
(Formerly 2199)

A study of problems, techniques, and materials in the improvement of instruction in secondary schools. A course for principals, heads of departments, and supervisors.

310-760. The Junior High School Credit 3(3-0)
(Formerly 2088)

The philosophy, organization, administration, curriculum, and activities of the junior high school.

310-761. Administration of the Elementary School Credit 3(3-0)
(Formerly 2196)

Role of the elementary school principal; administrative structure and policies, curriculum development, guidance, and in-service education of teachers.

310-762. High School Administration Credit 3(3-0)
(Formerly 2198)

A basic professional course for the principalship and for other administrative positions in junior high schools, senior high schools, and junior colleges. The materials adapted to the needs of those holding positions of these types and to experienced teachers who desire to prepare for such positions.

310-763. Public School Administration Credit 3(3-0)
(Formerly 2091)

Review of school administration, the organization and structure of the school system; agencies of administration and control, legal basis of school administration, standards for administration in the various functional areas.

310-762. Pupil Personnel Administration Credit 2(2-0)
(Formerly 2297)

Pupil accounting, records and reports, financial reports, school census, special school records, pupil adjustment and progress, health and safety and legal aspects of pupil administration.

310-765. School Publicity and Public Relations Credit 3(3-0)
(Formerly 2194)

Study of the interrelationships between the lay community and the schools. Appraisal and procedures, actual or proposed, for improvement of the relationships.

310-766. School Planning Credit 3(3-0)
(Formerly 2186)

An examination of the principles governing the selection and landscaping of school grounds, location and design of buildings, and care of plant from standpoint of use, sanitation, health, and attractiveness.

310-767. Public School Finance Credit 3(3-0)
(Formerly 2095)

Current problems, issues, and practices in costs of education, school support, sources of revenue, management of funds, budgeting, and accounting.

310-768. Principles of School Law Credit 3(3-0)
(Formerly Education 2174)

The study of statutes and judicial decisions of North Carolina affecting public school education. Legal authority, powers, and liabilities of school personnel; legal control and limitations of school finance, curriculum, and property.

310-769. Problems in Educational Administration and Supervision Credit 3(0-6)
(Formerly 2089)

An internship of field study on a supervised project arising out of the needs of the student. Prerequisite: 15 graduate hours including Organization and Administration, Supervision, and Curriculum.

310-775. The Community College and Post-Secondary Education Credit 3(3-0)
(Formerly 2392)

Philosophy, organization, and character of school programs needed to meet educational needs of individuals who desire to continue their education on the post-secondary level. Special attention is given to the trends in developing community colleges. Prerequisites: Ed. 727 or a graduate course in high school curriculum, Psych. 726 or graduate course in educational psychology or three or more years of teaching experience.

310-776. Principles of College Teaching Credit 3(3-0)
(Formerly 2394)

Principles involved in teaching at the college level; techniques of teaching aids; criteria used in evaluation. Prerequisite: Psych. 726 or graduate course in educational psychology.

310-780. Comparative Education Credit 3(3-0)
(Formerly 2093)

Historical and international factors influencing the development of national systems of education, recent changes in educational programs of various countries.

310-781. Issues in Elementary Education Credit 3(3-0)
(Formerly 2286)

A critical review of the background and functions of the elementary school as social institution. Attention is given to increasing the ability to formulate the generalizations of development and learning into a meaningful framework for appraising current educational thinking and practice and predicting the direction in which these must move if elementary school programs are to continue to improve.

310-782. Issues in Secondary Education Credit 3(3-0)
(Formerly 2287)

An analysis of the role of the high school as an educational agency in a democracy. Attention is given to: (1) philosophical, psychological, and sociological bases for the selection of learning experiences; (2) contrasting approaches to curriculum construction; (3) teaching methods and materials; (4) evaluation procedures; and (5) school-community relationships.

310-783. Current Research in Elementary Education Credit 3(3-0)
(Formerly 2288)

A critical analysis of the current research in elementary education and the implications of such for elementary school educative experiences.

310-784. Current Research in Secondary Education Credit 3(3-0)
(Formerly 2289)

A critical analysis of the current research in secondary education and the implications of such for high school educative experiences.

310-785. Independent Readings in Education I Credit 1(0-2)
(Formerly Ed. 2395)

Individual study and selected readings in consultation with an instructor. Prerequisite: 24 hours of graduate credit.

310-786. Independent Readings in Education II Credit 2(0-4)
(Formerly Ed. 2396)

Individual study and selected readings in consultation with an instructor. Prerequisite: 24 hours of graduate credit.

310-787. Independent Readings in Education III Credit 3(0-6)
(Formerly Ed. 2396)

Individual study and selected readings in consultation with an instructor. Prerequisite: 24 hours of graduate credit.

310-790. Seminar of Educational Problems Credit 3(1-4)
(Formerly 2392)

Intensive study, investigation, or research in selected areas of education; reports and constructive criticism. Prerequisites: A minimum of 24 hours in prescribed graduate courses.

310-791. Thesis Research Credit 3 s.h.
(Formerly 2292)

310-792. Advanced Seminar and Internship in Educational Administration Credit 3(0-6)
(Formerly 2090)

Seminar and supervised internship experiences relating to problems in administration and to the needs and interests of the student. (Restricted to students in the sixth year program in administration.)

ENGINEERING

Reginald L. Amory, Dean

Office: Cherry Hall

The School of Engineering offers a program of advanced study leading to the degree of Master of Science in Engineering. Requirements for admission to a degree program and for completing the master's degree are given in the description of degree programs section of the catalogue.

ADVANCED UNDERGRADUATE AND GRADUATE COURSES

400-602. Advanced Strength of Materials Credit 3(3-0)

Stress-strain in relations as applied to statically indeterminate structures, bending in curved bars, plates, shells, and beams on elastic foundations; strain energy concepts for formulation of flexibility matrix on finite elements; bending in beams and plates; introduction to cartesian tensor notation and matrix structural analysis. Prerequisite: 440-336 or equivalent.

400-603. Advanced Thermodynamics Credit 3(3-0)

Statistical mechanics and microscopic properties from statistical methods. Equilibrium, information, generalized coordinates, and general variables. Prerequisite: 440-442 or equivalent.

400-604. Analog Computer Applications Credit 3(2-3)

The course consists of an introduction to the analog computer; methods of programming for the solution of linear and non-linear differential equations, dynamic response of physical systems and simulation of physical systems and phenomena. Prerequisite: 225-300 or equivalent.

400-606. Automatic Control Theory Credit 3(3-0)

The automatic control problem; review of operational calculus; state and transient solutions of feedback control systems; types of servomechanisms and control systems; design principles. Prerequisite: 420-501 or equivalent.

400-612. Communication Systems Credit 3(3-0)

This course covers the factors affecting the performance of communication systems, such as intermodulation noise, thermal noise, bandwidth, and the design of pulse modulation systems including delta and pulse code. Communication systems using earth satellites are covered in great detail including space communication. Prerequisite: 420-565 or equivalent.

400-614. Communication Theory

Credit 3(3-0)

A course covering fundamental principles of modulation theory which are commonly used in the design of communication systems; linear modulation systems—amplitude, double and single sideband, and vestigial sideband modulation; and nonlinear modulation system—frequency and phase. Prerequisite: 225-500 and 420-452 or equivalent.

400-622. Electronic Engineering

Credit 4(3-3)

A study of various types of electronic circuits used in engineering practice—wave shaping and computing circuits, photosensitive devices and circuits; control and switching circuits; modulation and de-modulation circuits. Coordinated laboratory work with industrial applications and special projects. Prerequisite: 420-565 or equivalent.

400-624. Elementary Nuclear Reactor Theory

Credit 3(3-0)

A lecture course in the principles of chain reactors, slowing down of neutrons, neutron diffusion equations, space distribution of neutrons, conditions for criticality, reactor dimensions for simple geometries, elementary group theories, and time dependent reactor behavior. Prerequisite: 225-300 and 440-450 or equivalent.

400-625. Engineering and Environment

Credit 3(2-3)

An examination of the engineering role, impact, and demands upon the environment relative to its conditions, limitations, chain linkages and effects. Prerequisite: Consent of Instructor.

400-626. Engineering Research

Credit Variable

Special investigation adapted to the special abilities of individual students. Prerequisite: Consent of Instructor.

400-627. Fundamentals of Logic Systems

Credit 3(3-0)

Introduction to digital information handling concepts of counting, transfer, sequence control, selection, addressing and digital system control. Corequisite: 420-452 or equivalent.

400-628. Foundation Engineering

Credit 3(2-2)

Subsoil investigations, analysis and design of foundations and other substructures. Caisson and cofferdam design and methods of construction—ground water control. Prerequisite: 410-564 or equivalent.

400-632. Information Theory

Credit 3(3-0)

Probability theory and its application in the analysis of information transfer. Special attention is given to information in communications, random signals, noise processes, microscopic processes and macroscopic events. Prerequisite: 420-501 or equivalent.

400-634. Instrumentation-Theory and Applications

Credit 3(3-0)

Consideration is given to applications of software and hardware techniques of instrumentation. Attention is given to treatment of data, errors in measurements and instruments capabilities and limitations of instruments as to precision and accuracy. Commercial instruments, transducers and their specifications will be used as models to illustrate basic principles involved. Students will be encouraged to design instrumentation for measurements of both electrical and non-electrical quantities in systems, subsystems and processes. Prerequisite: 420-452 or equivalent.

400-642. Management, Organization and Industrial Economics Credit 3(3-0)

The production system, objectives and attitudes of production management,

production management models: decisions, planning, behavioral and control models. Operations and the design of the control system—inputs, process and output control. Industrial economy: concepts in economy analysis, selections, interest formulas, depreciation, pattern for analysis. Prerequisite: 400-443 or equivalent.

400-644. Matrix Analysis of Structures Credit 3(2-2)

Lecture and Laboratory. Review of matrix algebra; statically and kinematically, indeterminate structures; introduction to flexibility and stiffness methods; applications to beams, plane trusses and plane frames. Prerequisite: 410-457 or equivalent.

400-646. Network Synthesis Credit 3(3-0)

Use of positive real functions and linear graphs in the synthesis of passive networks. Investigation of the properties of the driving point and transfer functions of passive networks and the synthesis of one and two part networks using positive real functions. Linear graphs and topological aspects are introduced. Prerequisite: 420-448 or equivalent.

400-648. Numerical Analysis for Engineers Credit 3(3-0)

Scientific programming, error analysis, matrix algebra, eigenvalue problems, curve fitting approximations, interpolation, numerical differentiation and integration, solutions to simultaneous equations, and numerical solutions of differential equations. Prerequisite: Consent of Instructor.

400-650. Operations Research Credit 3(3-0)

Management decision making, queuing theory, probability and sequences, formulation of mathematical models of processes with orientation to optimizing by use of digital computers. Prerequisite: 225-224 or equivalent.

400-652. Plates and Shells Credit 4(2-4)

Lecture and Laboratory. Introduction to plane plate theory; membrane stresses in shells with axial symmetry; cylindrical shells; applications in the design of shell roofs, tanks pipelines and pressure vessels. Prerequisite: 410-455 or equivalent.

400-654. Projects in Electronic Networks and Systems Credit 3(1-6)

Special topics and laboratory work of special interest to the students in electronic networks and communications circuits; most of the work is given by the project method and emphasizes actual circuit construction. Prerequisite: 420-452 or equivalent.

400-655. Professional Development I Credit Variable (1-3)

Directed self-study by the student in exploring an area both of special interest to the student and of mutual interest to Architectural Engineering faculty member(s).

400-656. Professional Development II Credit Variable (1-3)

Continuation of 400-655.

400-660. Selected Topics in Engineering Credit 3(3-0)

Selected engineering topics of interest to students and faculty. The topics will be selected before the beginning of the course and will be pertinent to the programs of the students enrolled. Prerequisite: Consent of Instructor.

400-666. Special Projects Credit Variable (1-3)

Study arranged on a special engineering topic of interest to student and

faculty member, who will act as advisor. Topics may be analytical and/or experimental and encourage independent study. Prerequisite: Consent of Instructor.

400-670. Semiconductor Theory Credit 3(3-0)

An examination of the phenomena of solid-state conduction and devices using band modeling. Prerequisite: 420-565 or equivalent.

400-672. Theory of Elasticity Credit 3(3-0)

Introduction; stress; strain; stress-strain relations; energy principles; special topics. Prerequisites: 440-336 and 225-300 or equivalent.

440-674. Transmission of Signals and Power Credit 3(3-0)

Generalized transmission circuits; transmission line parameters; long distance steady state transmission; transients in transmission lines; signal transmission lines; high frequency lines. Prerequisites: 420-448 and 225-300 or equivalent.

GRADUATE COURSES

400-700. Advanced Reinforced Concrete Design Credit 3(2-2)

Advanced theory and methods applied to the design of reinforced concrete structures, including yield line methods, ultimate strength theory and limit design. Prerequisite: 410-455 or equivalent.

400-701 Advanced Structural Analysis Credit 3(3-0)

The analysis of various types of structural problems, including the applications of modern analytical methods. Prerequisite: 410-562 or equivalent.

400-702. Applied Numerical Methods Credit 3(3-0)

Numerical solutions to ordinary differential equations, initial-value and boundary-value problems, non-linear equations, numerical solution to partial differential equation, finite differences, and relaxation techniques. Stability of solutions. Prerequisite: 225-500 or equivalent.

400-710. Boundary Layer Theory Credit 3(3-0)

A study of fluid flow with effects of viscosity analyzed as a boundary layer phenomena derivation of general equations of motion, velocity potential and stream function, perturbation theory and determination of drag and lift for subsonic and supersonic flows. Prerequisite: 440-568 or equivalent.

400-715. Continuum Mechanics Credit 3(3-0)

The applications of the laws of mechanics and thermo-dynamics to the continuum: A rigorous development of the general equations applied to a continuum, the application and reduction of the general equations for specific cases of both solids and fluids. Prerequisite: 440-336 or equivalent.

400-722. Electromagnetic Wave Theory Credit 3(3-0)

Fundamental electromagnetic concepts at ultra high frequencies and above; analysis of transmission lines and networks; maxwell equations and their applications; wave guides and radiating systems. Prerequisite: 420-450 or equivalent.

400-724. Electronic Systems Analysis Credit 3(3-0)

An analytical approach using mathematics and graphical methods is used to arrive at solutions of problems encountered in interconnecting electrical, electronic, mechanical, and physical components to form a workable system.

The formulation of compatible interfaces and transformation functions to make a workable system is the objective of the problems considered. Model and simulation theory is also utilized. Prerequisite: 420-565 or equivalent.

400-728. Experimental Stress Analysis Credit 3(2-2)

Principles and methods of experimental stress analysis. Photoelastic and micromasurement techniques applied to strain and stress investigations. Experiments using structural models. Prerequisite: 410-457 or 400-602 or equivalent.

400-735. Heat Transfer I—Conduction Credit 3(3-0)

The development and application of the general energy equations. Heat transfer through walls, cylinders, real boundary conditions, and numerical procedures. Prerequisite: 440-562 or equivalent.

400-736. Heat Transfer II—Radiation Credit 3(33-0)

A study of energy transfer by means of thermal radiation. Black body radiation, gray body radiation, gas radiation, and real body radiation. Prerequisite: 440-562 or equivalent.

400-738. Irreversible Thermodynamics Credit 3(3-0)

A study of processes which are inherently entropy producing. Development of general equations, theory of minimum rate of entropy production, mechanical processes, life processes, and astronomical processes. Prerequisite: 440-603 or equivalent.

400-740. Machine Tool Design Credit 3(3-0)

Basic principles of single point and multiple point tools, materials, forces velocities, and power requirements. Dies and punches, material and manufacture, die and assemblies design clearances, supports, stops and pilots, strippers and knockouts. General requirements of a machine tool, design principles of machine tools, stiffness and rigidity standardization of speeds and feeds, layout of speed change gears, design of some constructional elements. Prerequisite: 440-226 or equivalent.

400-742. Mechanical Properties and Theories of Failure Credit 3(3-0)

Static properties in tension and compression, stress and combined stresses, fatigue, impact, creep and temperature. Various theories of failure under the above loading conditions. Applications. Prerequisite: 440-336 or equivalent.

400-744. Network Matrices and Graphs Credit 3(3-0)

Use of vector space techniques in the description, analysis and realization of networks modeled as matrices and graphs. The course investigates vector space concepts in the modeling and study of networks. The system concept of networks is introduced and explored as a dimensional space consideration in terms of matrices and graphs. Prerequisite: 420-501 or equivalent.

400-750. Statistical Methods and Quality Control Credit 3(3-0)

Statistical series, frequency distribution and its analysis, central tendency, arithmetic mean, dispersion and skewness, time series analysis, the least squares methods, linear and nonlinear. The normal curve, theory of sampling, index numbers. Collection of data, statistical tables, graphical presentation. Control charts for measurements and attributes, acceptance sampling by attributes and by variables. Prerequisite: 225-624 or equivalent.

400-755. Plastic Analysis and Design Credit 3(3-0)

Behavior of structural steel beyond the elastic limit. Ultimate load theory, the analysis and design of steel framed structures and components. Strength and behavior of structures stressed in the plastic range. Prerequisites: 410-457 and 410-461 or equivalent.

400-757. Physical Metallurgy of Industrial Alloys Credit 3(3-0)

Review of principles of alloying and heat treatment and their application to commercially important alloy systems. Principles of corrosion. Prerequisites: 440-226 and 440-560 or equivalent.

400-759. Prestressed Concrete Theory and Design Credit 3(3-0)

Theory and methods of design for prestressed concrete structures. Materials and construction techniques, ultimate strength design. Prerequisite: 410-455 or equivalent.

400-764. Rheology Credit 3(3-0)

Study of the flow and deformation of matter. A rigorous analysis of the various modes of deformation of matter, space, deformation, strain, stress, strain-rate, creep, non-newtonian fluids, and plasma flows. Prerequisite: Consent of Instructor.

400-767. Structural Dynamics Credit 3(3-0)

A study of structures subjected to dynamic loading. Formulation of mass-lumped and consistent, stiffness and damping matrices. Equivalent structural damping and elastic-plastic effects on response. Prerequisite: 400-644 or equivalent.

400-772. Theory and Design of Digital Systems Credit 3(3-0)

Digital system concepts of language models, algorithms, manipulative schemes, information structures, and pulse networks. Prerequisite: Consent of Instructor.

400-774. Theories of Manufacturing Processes Credit 3(3-0)

Review of metal cutting and forming, material behavior characteristics related to cutting and forming. Metal cutting analysis, mechanics of chip formation, thermal aspects of cutting, prediction of tool wear and tool life. Metal forming analysis, hot working and cold working, upper and lower bound solutions, slip line theory, plane strain. Applications to rolling, forging, wire drawing, extrusion, deep drawing and bending. Prerequisite: 440-226 or equivalent.

400-776. Theory of Plasticity Credit 3(3-0)

Basic concepts of plastic deformation, trusses and beams, plane shear theory, axially symmetric problems, torsion, limit analysis, and extremum principles. Prerequisite: 400-672 or equivalent.

400-777. Thesis Credit 6(6-0)

400-778. Theory of Vibrations Credit 3(3-0)

Vibration analysis of systems with one, two or multi-degrees of freedom. Instrumentation, continuous systems, computer techniques. Prerequisite: 440-566 or equivalent.

400-779. Advanced Structural Steel Design Credit 3(2-2)

Modern methods and advanced theory applied to the design of steel struc-

tures. Project design includes the solution to various types of framed structures. Prerequisites: 410-457 and 410-563 or equivalent.

ENGLISH

John O. Crawford, Acting Chairman
Office: 202 Communications Building

The Department of English offers a concentration of studies for persons seeking to improve their knowledge of English and American literature and language and for individuals seeking a Master of Science in Education with concentration in English.

Requirements for Admission to a Degree Program

In addition to the general requirements specified in the description of the degree programs in Education, a student wishing to be accepted as a candidate for the Master of Science in Education with concentration in English must have earned the following in undergraduate studies:

Twenty-four (24) semester hours in English courses above freshman composition. The hours must include at least three semester hours of Shakespeare, three of American literature, three of English literature, three of world literature or contemporary literature, and three of advanced grammar and composition.

A student who fails to meet these qualifications will be expected to satisfy the requirements by enrolling in undergraduate courses before beginning his graduate studies in English.

Requirements for a Degree

Non-Thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. English 700, 754, 770
2. 15 semester hours selected from the following:
English 603, 620, 628, 702, 704, 750, 751, 752, 755.

Thesis Option: 30 s.h. required

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. English 700, 754, 770
2. 12 semester hours selected from the following: 620, 628, 629, 702, 704, 720, 750, 751, 752, 755.
3. Thesis Research: 3 semester hours.

For Advanced Undergraduates and Graduates

212-603. Introduction to Folklore (Formerly 2498)

Basic introduction to the study and appreciation of folklore. (Cross listed as Anthropology 603.)

212-620. Elizabethan Drama Credit 3(3-0) (Formerly English 2491)

Chief Elizabethan plays, tracing the development of dramatic forms from early works to the close of the theaters in 1642. Prerequisite: English 220 and 221; 210.

212-621. Grammar and Composition for Teachers Credit 3(3-0) (Formerly English 2972)

A course designed to provide a review of the fundamentals of grammar and composition for the elementary or secondary school teacher. (Not accepted for credit toward undergraduate or graduate concentration in English.)

212-626. Children's Literature Credit 3(3-0)
(Formerly English 2476)

A study of the types of literature designed especially for students in the upper levels of elementary school and in junior high school. Prerequisites: Graduate standing or English 101, Humanities 200-201. (Not acceptable for credit toward undergraduate or graduate concentration in English.)

212-628. The American Novel Credit 3(3-0)
(Formerly English 2978)

A history of the American novel from Cooper to Faulkner, Melville, Twain, Howells, James, Dreiser, Lewis, Hawthorne, Faulkner, Hemingway will be included. Prerequisite: English 210 or 700.

212-629. The Negro Writer in American Literature Credit Credit 3(3-0)
(Formerly English 2979)

A study of prose, poetry, and drama by Afro-American authors. Their works will be studied in relation to the cultural and literary traditions of their times. Dunbar, Chesnutt, Johnson, Cullen, Bontemps, Hughes, Wright, Ellison, Baldwin, and Yerby will be included. Prerequisite: Graduate standing or English 101, Humanities 220-201.

For Graduate Students Only

212-700. Literary Analysis & Criticism Credit 3(3-0)
(Formerly 2485)

An introduction to intensive textual analysis of poetry, prose fiction, prose non-fiction, and drama. A study of basic principles and practices in literary criticism and of the various schools of criticism from Plato to Eliot.

212-702. Milton Credit 3(3-0)
(Formerly 2486)

A study of the works of Milton in relation to the cultural and literary trends of seventeenth-century England. Emphasis is placed upon Milton's poetry.

212-704. Eighteenth Century English Literature Credit 3(3-0)
(Formerly 2487)

A study of the major prose and poetry writers of the eighteenth century in relation to the cultural and literary trends. Defoe, Swift, Fielding, Addison, Pope, Johnson, and Blake will be included.

212-710. Language Arts for Elementary Teachers Credit 3(3-0)
(Formerly 2488)

A course designed to provide elementary school teachers with an opportunity to discuss problems related to the language arts taught in the elementary school. (Not accepted for credit towards concentration in English.)

212-720. Studies in American Literature Credit 3(3-0)
(Formerly 2489)

A study of major American prose and poetry writers.

212-750. Romantic Prose and Poetry of England Credit 3(3-0)
(Formerly 2490)

A study of nineteenth-century British authors whose works reveal char-

acteristics of Romanticism. Wordsworth, Coleridge, Shelley, Keats, Byron, Lamb, Carlyle and De Quincey will be included.

- 212-751. Modern British and Continental Fiction** Credit 3(3-0)
(Formerly 2491) Prerequisite: English 700

A study of British and European novelists from 1914 until the present. Included in the study are Joyce, Kafka, Gide, Mann, and Camus.

- 212-752. Restoration and 18th Century Drama** Credit 3(3-0)
(Formerly 2492)

A study of the theatre and drama in relation to the cultural trends of the period. Etherege, Farquhar, Vanbrugh, Congreve, Fielding, Gay, Steele, Goldsmith, and Sheridan will be included.

- 212-753. Literary Research and Bibliography** Credit 3(3-0)
(Formerly 2493)

An introduction to tools and techniques used in investigation of literary subjects.

- 212-754. History and Structure of the English Language** Credit 3(3-0)
(Formerly 2494)

A study of the changes in the English language—syntax, vocabulary, spelling, pronunciation, and usage—from the fourteenth century through the twentieth century.

- 212-755. Contemporary Practices in Grammar and Rhetoric** Credit 3(3-0)
(Formerly 2495)

A course designed to provide secondary teachers of English with experiences in linguistics applied to modern grammar and composition.

- 212-770. Seminar** Credit 3(3-0)
(Formerly 2499) Prerequisite: 15 hours of graduate-level courses in English.

Provides an opportunity for presentation and discussion of thesis, as well as selected library or original research projects from non-thesis candidates.

FOREIGN LANGUAGES

Waverlyn N. Rice, Chairman

Office: 300 Communications Building

Requirements for Admission to a Degree Program in French

In addition to the general requirements specified in the description of the degree programs in Education, a student wishing to be accepted as a candidate for the degree Master of Science in Education with concentration in French must hold or be qualified to hold a class A teaching certificate in French.

Requirements for a Degree in French

Thesis Option: 30 s.h. required

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. French 720 and 724.
2. 12 additional s.h. in graduate-level courses in French.
3. 3 hours of electives.
4. Thesis Research.

Non-thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. French 720 and 724.
2. 12 additional semester hours in graduate-level French courses.
3. 3 hours of electives in education, French, or courses related to French.

For Advanced Undergraduates and Graduates

217-602. Problems and Trends in Foreign Languages Credit 3(3-0)
(Formerly French 2571)

Problems encountered by teachers given consideration. Place and purpose of foreign languages in the curriculum today.

217-603. Oral Course for Teachers of Foreign Languages Credit 3(3-0)
(Formerly French 2572)

Designed for teachers of foreign languages, to improve pronunciation and spelling.

217-606. Research in the Teaching of Foreign Languages Credit 3(3-0)
(Formerly French 2573)

The study of a special problem in the teaching of a foreign language.

217-607. French Literature of the Seventeenth Century Credit 3(3-0)
(Formerly French 2574)

A study of Classicism through masterpieces of Corneille, Racine, Moliere, other authors of the "Golden Period" in French letters. Conducted in French.

217-608. French Literature of the Eighteenth Century Credit 3(3-0)
(Formerly French 2575)

A study in particular of the life and works of Montesquieu, Voltaire, Rousseau, and the Encyclopedists.

217-609. French Literature in the Nineteenth Century Credit 3(3-0)
(Formerly French 2576)

A study of the great literary currents of the nineteenth century, Romanticism and Realism.

217-610. The French Theatre Credit 3(3-0)
(Formerly French 2577)

A thorough study of the French theatre from the Middle Ages to the present.

217-612. The French Novel Credit 3(3-0)
(Formerly French 2578)

A study of the novel from the seventeenth century to the present.

217-614. French Syntax Credit-3(3-0)
(Formerly French 2579)

Designed to teach grammar on an advanced level.

For Graduate Students Only

217-720. Advanced Reading and Composition Credit 3(3-0)
(Formerly 2585)

A composition course with emphasis on idiomatic expressions.

217-722. Romantic Movement in France (1820-1848) Credit 3(3-0)
(Formerly 2586)

Background study of Chateaubriand and Madame de Stael. Emphasis will be placed on Lamartine, Hugo, Vigny, and Musset in poetry. Other genres, e.g., the theatre, novel, etc., will be studied.

217-724. Seminar in Foreign Languages Credit 3(3-0)
(Formerly 2587)

Scholarly papers from students, faculty, and guest lecturers will be presented. Scholarly papers are required of all candidates for a degree with concentration in French.

217-726. Contemporary Literary Criticism Credit 3(3-0)
(Formerly 2588)

Methods and purposes of literary criticism and of French literary critics.

217-728. Independent Study in Foreign Languages Credit 3(3-0)
(Formerly 2589)

HEALTH, PHYSICAL EDUCATION AND RECREATION

Roy D. Moore, Chairman
Office: Moore Gymnasium

The Department of Health, Physical Education and Recreation offers a Master of Science degree in Education with concentration in Physical Education.

Requirements for Admission to a Degree Program

In addition to the general requirements specified in the description of the degree programs in Education, a student wishing to be accepted as a candidate must hold or be qualified to hold a class A teaching certificate in Health, Physical Education and Recreation.

Requirements for a Degree

Non-thesis Option: 30 s.h. required

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. Physical Education 785, 786 and 798
2. 9 s.h. in physical education courses
3. 12 s.h. in electives

Thesis Option: 30 s.h. required

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. Physical Education 785, 786, 798 and 799
2. 6 additional s.h. in physical education courses
3. 12 s.h. in electives.

For Advanced Undergraduates and Graduates

HEALTH EDUCATION

330-651. Personal, School and Community Health Problems Credit 3(3-0)
(Formerly 2771)

A study of personal, school and community health problems and resources. Emphasis is placed on the control of communicable diseases, healthful

school living and the development in individuals of the scientific attitude and a positive philosophy of healthful living.

330-652. Methods and Materials in Health Education for Elementary and Secondary School Teachers Credit 3(3-0)
(Formerly 2772)

A study of the fundamentals of the school health program; pupil needs, methods, planning, instruction teaching techniques, selection and evaluation of materials for the elementary and secondary programs, and the use of the community resources.

PHYSICAL EDUCATION

330-655. Current Problems and Trends in Physical Education Credit 3(3-0)
(Formerly 2775)

A practical course for experienced teachers. Consideration given to individual problems in physical education with analysis of present trends.

330-656. Administration of Interscholastic and Intramural Athletics Credit 3(3-0)
(Formerly 2776)

A study of the relation of athletics to education, and the problems of finance, facilities, scheduling, eligibility, and insurance. Consideration given to the organization and administration of intramural activities in the school program.

330-657. Community Recreation Credit 3(3-0)
(Formerly 2777)

A study of recreational facilities and problems with consideration being given to the promotion of effective recreational programs in rural and urban communities.

330-658. Current Theories and Practices of Teaching Sports Credit 3(3-0)
(Formerly 2778)

Methodology and practice at various skill levels. Emphasis is placed on seasonal activity.

For Graduates Only

PHYSICAL EDUCATION

330-779. Prescribed Methods of Rehabilitating the Physically Handicapped Credit 3(3-0)
(Formerly 2779)

This course is designed to train the student in the use of therapeutic exercise as it applies to physical rehabilitation of the physically handicapped. There will be discussions and laboratory practice of physiological and kinesiological principles of physical restoration.

330-780. Organization and Administration of Health, Physical Education and Recreation in Elementary Schools Credit 3(3-0)
(Formerly 2780)

This course studies the modern developments in methods and materials of elementary school physical education. Prerequisite: Consent of the instructor.

- 330-785. Research in Health, Physical Education and Recreation** Credit 3(3-0)
(Formerly 2785)

A course that is designed to study the various methods of investigating the principles underlying the work in the field of health, physical education and recreation. Prerequisite: Consent of the instructor.

- 330-786. Scientific Foundations of Physical Education** Credit 3(3-0)
(Formerly 2786)

A course designed to discuss scientific approaches to physical education and methods of applying these scientific investigations to the classroom. Prerequisite: Consent of the instructor.

- 330-787. Scientific Foundations of Physical Fitness** Credit 3(2-2)

A study of the concepts of physical fitness and the application of these concepts to school and community programs. Prerequisite: Consent of the instructor.

- 330-798. Seminar** Credit 3(3-0)
(Formerly 2798)

A course of study in which the research projects are prepared, discussed, and evaluated by the faculty and students.

- 330-799. Thesis Research** Credit 3
(Formerly 2799)

HISTORY AND SOCIAL STUDIES

Frank H. White, Chairman

Office: 318 Hodgkin Hall

The Department of History offers a Master of Science degree in Education with concentration in History or Social Studies.

Requirements for Admission to a Degree Program

In addition to the general requirements specified in the description of the degree program in Education, a student wishing to be accepted as a candidate for the degree Master of Science in Education with concentration in History or Social Studies must hold or be qualified to hold a class A teaching certificate in History or Social Studies.

Requirements for a Degree

HISTORY

Non-thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. History 604, 703 and 730.
2. 9 additional s.h. in history courses.
3. 3 s.h. in electives in history, education, or related disciplines.

Thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. History 604, 703, and 730.
2. 9 additional s.h. in history courses.
3. A thesis on a subject in history or the teaching of history.
4. 3 s.h. of electives.

SOCIAL STUDIES

Non-thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. 9 hours of history.
2. 12 hours from at least 3 of the following:
political science, sociology, economics, and geography.
3. 3 s.h. in electives in history, education, geography, political science, or sociology.

Thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must complete the following:

1. 6 hours of history and 12 hours from at least 3 of the following:
Political Science, sociology, economics and Geography.
2. A thesis.
3. 3 hours of electives.

For Advanced Undergraduates and Graduates

HISTORY

233-600. The British Colonies and the American Revolution Credit 3(3-0)
(Formerly History 2878)

The evolution of colonial institutions, growth of the American colonies, the American Revolution and its aftermath.

233-603. The Civil War and Reconstruction, 1860-1877 Credit 3(3-0)
(Formerly History 2881)

This course begins with a summary of the Civil War. It then treats the historiography of the Reconstruction period, the reconstruction of the South, and the restoration of the Union.

233-604. Contemporary History of the United States Credit 3(3-0)
(Formerly History 2882)

An intensive study and analysis of important problems in American history since 1928. Emphasis will be placed on methods of historical research and writings.

233-605. The Soviet Union Since 1917 Credit 3(3-0)
(Formerly History 2883)

A discussion of the ideological background of the Soviet Union with emphasis on the doctrines of Marx, Engels, and Lenin. This is followed by events leading up to the revolution of 1917 and the establishment of Communist autocracy, the new economic policy, the first Five-year Plan, Stalin's doctrine, and Soviet Communism since the death of Stalin.

2322-615. Seminar in the History of Black Americans Credit 3(3-0)

A reading and discussion course which gives concentrated attention to various aspects of the life and history of the Afro-Americans.

233-616. Seminar in African History Credit 3(3-0)

Reading and discussion of selected topics in the history of Africa.

233-620. American Social and Cultural Forces to 1865 Credit 3(3-0)

A study of the social and cultural forces in the development of society in the United States of 1865.

- 233-621. Social and Cultural Forces in the United States Since 1865** Credit 3(3-0)

A continuation of History 620. It is also open to those who wish to take the course separately.

- 233-625. Seminar in Historical Method** Credit 3(3-0)

Research and training in historical writing culminating in the presentation of a research paper.

- 233-630. Studies in European History, 1815-1914** Credit 3(3-0)
(Formerly 703)

An intensive study of the main problem in selected periods of Nineteenth Century European history.

- 233-631. Studies in Twentieth Century Europe, 1914 to the Present** Credit 3(3-0)
(Formerly 707)

Reading course in Contemporary European History, 1914 to the present.

COURSES FOR GRADUATES ONLY

- 233-700. The French Revolution and Napoleon** Credit 3(3-0)
(Formerly History 2888)

A study of the causes, course, and major consequences of the revolutionary movement; also the program and role of Napoleon.

- 233-701. Recent United States Diplomatic History** Credit 3(3-0)
(Formerly 2889)

The diplomacy of the United States since 1900. Special emphasis will be given to "dollar diplomacy" in the Caribbean and the Far East, the diplomacy of World War I and World War II as well as the Cold War that followed. Attention will also be given to our relations with Korea, Vietnam, and the Middle East.

- 233-702. Social and Political History of England from 1714 to 1832** Credit 3(3-0)
(Formerly History 2890)

Particular attention is given to political, social, cultural, and diplomatic aspects of England during the eighteenth century.

- 233-704. The United States in the Early 20th Century** Credit 3(3-0)
(Formerly History 2893, 705)

The principal economic, social, political and cultural development of the nation from 1898 to 1929: Spanish American War, the Progressive Era, the New Freedom; World War I; prosperity and depression.

- 233-706. Independent Study in History** Credit 3(3-0)
(Formerly History 2894)

Independent reading, research and writing.

- 233-712. The Black American in the Twentieth Century** Credit 3(3-0)

An analysis of the struggle for full rights as citizens in the Twentieth Century.

- 233-730. Seminar in History** Credit 3(3-0)

Intensive reading and study in the field of history.

PHILOSOPHY

ADVANCED UNDERGRADUATE AND GRADUATE

- 233-608. **Culture and Value** Credit 3(3-0)
(Formerly 5970)

A critical study of the nature and justification of basic ethical concepts in light of historical thought.

- 233-609. **Contemporary Philosophy** Credit 3(3-0)
(Formerly 5971)

A critical investigation of some contemporary movements in philosophy with special emphasis on existentialism, pragmatism, and positivism.

GEOGRAPHY

Advanced Undergraduate and Graduate

- 233-640. **Topics in Geography of Anglo-America** Credit 3(3-0)
(Formerly 610)

Selected topics in cultural geography of the United States and Canada are studied intensively. Emphasis is placed upon individual reading and research and upon group discussion.

- 233-641. **Topics in World Geography** Credit 3(3-0)
(Formerly 720)

Selected topics in world geography are studied intensively. Concern is for cultural characteristics and their interrelationships with each other and with habitat. Emphasis is upon reading, research and discussion.

- 233-650. **Physical Geography I** Credit 3(3-0)
(Formerly 605)

A study of the surface of the earth, including means of representation of the earth's surface, physical elements of weather and climate, climatic regions, and the earth's waters and elements.

- 233-651. **Physical Geography II** Credit 3(3-0)
(Formerly 606)

A continuation of Physical Geography I concentrating on climate and weather, natural vegetation and animal life, soils and association of physical landscape attributes.

HOME ECONOMICS

Harold E. Mazyck, Chairman

Office: Benbow Hall

The Department of Home Economics offers a program leading to the Master candidacy and for the degree as listed earlier in this catalogue in the description of degree programs.

The department also offers courses for individuals desiring advanced study in child development, clothing, textiles and related arts, home economics education, food administration, and for those seeking renewal of teaching certificates.

FOOD AND NUTRITION

Advanced Undergraduate and Graduate

- 170-630. Advanced Nutrition.** Credit 3(3-0)
(Formerly F&N 1880)

Advanced discussion of the roles of vitamins, minerals, protein, fat, and carbohydrate in the body and their interrelationships. Prerequisites: F&N 337 and Chemistry 251 or concurrent.

- 170-637. Special Problems in Food and Nutrition** Credit 3(0-6)
(Formerly F&N 1877)

Individualized work on special problems in food and nutrition.

- 170-638. Recent Developments in Food and Nutrition** Credit 2(2-0)

A study of recent research in food and nutrition through discussion of reports in current scientific journals.

- 170-639. Seminar in Food and Nutrition** Credit 1(1-0)
(Formerly F&N 1879)

History of food and nutrition; past and present theories and methods; specialists and their contributions.

For Graduate Students Only

- 170-731. Nutrition and Health** Credit 2(2-0)
(Formerly F&N 1888)

Relation of essential nutrients to metabolism; evaluation of nutritional status. Prerequisite: F&N 630 or its equivalent.

- 170-732. Nutrition and Disease** Credit 4(3-2)
(Formerly F&N 1889)

Biochemistry of deficiency diseases; diet as a therapeutic tool. Prerequisite: F&N 338 or its equivalent.

- 170-733. Nutrition during Growth and Development** Credit 3(2-2)
(Formerly F&N 1890)

Nutritional needs of children, development of food habits, school lunch programs.

- 170-734. Nutrition Education** Credit 4(1-6)
(Formerly F&N 1886)

Interpretation of the results of nutrition research for use with lay groups. Preparation of teaching materials based on research for use in nutrition education programs.

- 170-735. Experimental Foods** Credit 4(1-6)
(Formerly F&N 1885)

Objective and subjective evaluation of food; development and testing of recipes; experimentation with food. Prerequisite: F&N 436 or its equivalent.

- 170-736. Research Methods in Food and Nutrition** Credit 4(2-6)
(Formerly F&N 1887)

Experimental procedures in food and nutrition research; care of experimental animals; analysis of food, body fluids, animal tissues. Prerequisites: Analytical Chemistry and Biochemistry.

- 170-739. Thesis Research** Credit 3(0-6)
(Formerly 1899)

CHILD DEVELOPMENT

Advanced Undergraduate and Graduate

- 170-610. Measurement and Evaluation in Child Development** Credit 3(3-0)
(Formerly CD 1970)

A study of the methods of measurement, evaluation and diagnosis in learning-teaching situations. Prerequisites: Psychology 320 and permission of the instructor.

- 170-612. Senior Seminar**
(Formerly CD 1972)

A review of recent research findings and discussion of current trends and information related to young children. Concurrent with Education 558.

- 170-613. Methods in Early Childhood (Also Education 684)** Credit 3(3-0)
(Formerly CD 1973)

Administration, principles, practices, methods, and resources in the organization of preschool and primary programs. An interdisciplinary and team approach. Observation of teaching styles and strategies.

- 170-614. Curriculum in Early Childhood (Also Education 683)** Credit 3(3-0)
(Formerly CD 1974)

Curriculum experiences and program planning appropriate to early childhood education.

Graduate

- 170-715. Special Problems in Child Development** Credit 3(3-0)
(Formerly 1985)

Opportunity for students to work individually or in small groups on child development problems of special interest. Work may represent either survey of a given field or intensive investigation of a particular problem. The student should consult the instructor before registering for this course.

CLOTHING, TEXTILES, AND RELATED ARTS

Advanced Undergraduate and Graduate

- 170-620. Fashion Coordination** Credit 1(1-0)
(Formerly C.T.R.A. 1870)

A study of the factors which influence the fashion world; trends, designers, centers and promotion. Field trips to fashion centers.

- 170-621. Seminar in Clothing, Textiles and Related Art** Credit 1(1-0)
(Formerly C.T.R.A. 1871)

A study of current trends in the field of Clothing, Textiles, and Related Art.

- 170-622. Economics of Clothing and Textiles** Credit 2(2-0)
(Formerly C.T.R.A. 1872)

A study of the economic aspects of clothing and household textiles as they relate to family needs and resources in their quest for maximum satisfaction and serviceability.

- 170-623. Textile Chemistry** Credit 3(1-4)

An introduction to the chemistry of the major classes of natural and man-made fibers, including their structure, properties, and reactions. Laboratory work will include consideration of chemical damage to fabrics, finishes, and dyes. Prerequisites: Chemistry 104 and 105, Textiles 123.

- 170-624. Advanced Textiles** Credit 3(2-2)
(Formerly C.T.R.A. 1872)

A study of the physical and chemical properties of textile fibers and fabrics with emphasis on recent scientific and technological developments.

- 170-625. Experimental Clothing and Textiles** Credit 3(1-4)

Experimentation with new woven fabrics and non-textiles such as furs, leathers, and suedes.

HOME ECONOMICS

Advanced Undergraduate and Graduate

- 170-603. Special Problems in Home Economics I** Credit 3(1-4)
(Formerly H. Ec. 1973)

Problems in the various areas of Home Economics with implications for secondary teaching may be chosen for individual study.

- 170-604. Seminar in Home Economics Education** Credit 2(2-0)
(Formerly H. Ec. 1974)

Consideration of problems resulting from the impact of social change on the various fields of Home Economics in relation to the secondary school vocational homemaking programs.

FOOD ADMINISTRATION

Advanced Undergraduate and Graduate

- 170-645. Special Problems in Food Administration** Credit 2(0-4)
(Formerly I. M. 1975)

Individual work on special problems in food administration.

- 170-646. Readings in Food Administration** Credit 1(1-0)
(Formerly I.M. 1976)

A study of food administration through reports and discussion of articles in current trade periodicals and scientific journals.

- 170-647. Seminar in Food Administration** Credit 1(1-0)
(Formerly I. M. 1977)

Discussion of problems involved in the organization and management of specialized food service areas.

Graduate

- 170-706. Special Problems in Home Economics II** Credit 3(3-0)
(Formerly H. E.c. 1986)

A study of research and major contemporary issues with consideration of their impact on trends and new directions in home economics.

INDUSTRIAL EDUCATION

George C. Gail, Chairman

Office: Price 105

For admission to the degree programs and for requirements, see the degree programs listed earlier in the catalogue.

INDUSTRIAL EDUCATION

Advanced Undergraduate and Graduate

- 361-616. Plastic Craft** Credit 3(2-2)
(Formerly 3576)

For teachers of industrial arts, arts and crafts and those interested in plastics as a hobby. Operations in plastics analyzed and demonstrated; design, color, kinds, and uses of plastics, how plastics are made and sold; vocational information. Projects suitable for class use constructed.

- 361-617. General Crafts** Credit 3(2-2)
(Formerly 3577)

Principles and techniques of crafts used in school activity programs. Emphasis is on materials, tools and processes used in elementary schools and industrial art sources. Open to others desiring craft experience.

- 361-618. Elementary School Industrial Education Programs** Credit 3(3-0)
(Formerly I.A. 3586)

Aims, content, equipment and methods utilized in programs designed to integrate K-6 elementary school activities with the study of industry and technology.

- 361-635. Graphic Arts** Credit 3(2-2)
(Formerly 3575)

Fundamentals of typography, hand composition, press operation, block printing, silk screen techniques, and other reproduction methods, also book-binding.

SAFETY AND DRIVER EDUCATION

Advanced Undergraduate and Graduate

- 361-651. Driver Ed. and Teacher Training** Credit 3(2-2)

This course provides the student with the necessary preparation to administer the in-car phase of high school driver education. Special attention will be given to methods of developing safe driving skills and habits.

- 361-652. Advanced Driver Education and Teacher Training** Credit 3(2-2)

Advanced professional preparation in teaching driver education. Laboratory experience with the multiple care range and driving simulator. Prerequisite: S.D. Ed. 651 or its equivalent.

- 361-653. Driver Education and General Safety** Credit 3(3-3)

Designed to present facts and information concerning the cost, in money and human suffering, of accidents in the home, industry, school, and transportation. Included in the establishment of knowledge and background conducive to the development of personal activities and practices which reduce accidents.

- 361-655. Automotive Technology for Safety and Driver Education** Credit 3(3-0)

A study of the functional systems of the automobiles as they relate to traffic safety.

- 361-660. Industrial Cooperative Programs** Credit 3(3-0)
(Formerly I. E. 3579)

For prospective teachers of vocational education. Principles, organization and administration of industrial cooperative programs.

- 361-661. Organization of Related Study Materials** Credit 3(3-0)
(Formerly I.E. 3580)

Principles of scheduling and planning pupils' course and work experience, selecting and organizing related instructional materials in I.C.T. programs.

- 361-662. Teaching Problems in Industrial Education** Credit 3(3-0)
(Formerly I. E. 3581)

Problems involve objectives, curriculum content, text and reference books, teaching aids, class organization and administration, safety programs, teaching techniques and plans, remedial instruction, industry and community relations. Prerequisite: I. E. 465.

- 361-663. History and Philosophy of Industrial Education** Credit 3(3-0)
(Formerly I. E. 3582)

Chronological and philosophical development of industrial education with special emphasis on its growth and function in American schools.

For Graduate Students Only

- 361-715. Comprehensive General Shop** Credit 3(2-2)
(Formerly I. A. 3590)

Problems involving wood, electricity-electronics, graphic arts, metal and crafts; emphasis on organization, instructional materials and procedures.

- 361-717. Industrial Arts Seminar I** Credit 3(2-2)
(Formerly 3587)

An advanced study in modern technology, may deal with recent developments, trends, practices and procedures of manufacturing and construction industries. Individual and group research and experimentation, involving selection, design, development and evaluation of technical reports and instructional materials for application in Industrial Arts program. Prerequisite: 510 or 715.

- 361-718. Industrial Arts Problems II** Credit 3(2-2)
(Formerly 3588)

Continuation of 717.

- 361-719. Advanced Furniture Design and Construction** Credit 3(2-2)
(Formerly I. A. 3589)

Laws, theories and principles of aesthetic and structural design, planning, designing, pictorial sketching and furniture drawing, Laboratory work involving setting up, operating, and maintaining furniture production equipment, plus firms, requisitions, orders, invoices, stock bills, buying and professional problems. Prerequisite: Permission from instructor.

- 361-731. Advanced Drafting Techniques** Credit 3(2-2)
(Formerly I. A. 3591)

For teachers with undergraduate preparation or trade experience. School techniques, standards, conventions, devices, experimentation in advance of opportunities offered in regular courses. Use of literature and research expected.

- 361-750. Innovations in Safety and Driver Education** Credit 3(3-0)

Workshop or institute dealing with contemporary problems and methods in safety and driver education.

361-751. Psychological Factors in Safety and Driver Education Credit 3(3-0)

A study of psychological variables influencing the driver's behavior. Emphasis on emotional, attitudinal, psychophysical, and social characteristics prevalent in the traffic scene.

361-752. Alcohol and Safety and Driver Education Credit 3(3-0)

Consideration of the psychological and physical aspects of alcohol and its resulting problems on the traffic scene.

361-755. Multimedia and Driver Education Credit 3(3-0)

Principles and theory of multi-media communications. Planning, utilization, and production of materials. Current trends and survey of literature in multimedia as related to safety and driver Education.

361-756 Seminar in Safety and Driver Education Credit 3(3-0)

Presentation and consideration of safety and traffic education research, issues and problems. Relationships within school, community and related agencies.

361-757. Administration and Supervision of Safety and Driver Education Credit 3(3-0)

Organization, administration, and supervision of safety and driver education programs. Methods of organization, techniques, materials, program planning, records and reports, financing and insurance, procurement, personnel selection, planning and securing facilities.

361-758. Independent Project in Safety and Driver Education Credit 3(1-3)

Study on an individual or group basis in the field of safety and driver education. In consultation with an adviser.

361-759. Thesis Research Credit 3(3-0)

361-762. Construction and Use of Instructional Aids Credit 3(2-2)
(Formerly I. A. 3592)

The analysis of various instructional aids useful in shop teaching, planning, designing, and construction of various teaching aids. Facilities for laboratory work provided.

361-763. General Industrial Education Programs Credit 3(3-0)
(Formerly I. E. 3593)

A study of the development of local, state, and national levels of day industrial schools, evening industrial schools, part-time day and evening schools. Their organization types, courses of study, scope of movement; study of special student groups, fees and charges, building and equipment.

361-764. Supervision and Administration of Industrial Education Credit 3(3-0)
(Formerly I. Ed. 3594)

A study of the relation of industrial education to the general curriculum and the administration responsibilities involved. Courses of study, relative costs, coordination problems, class and shop organization, and the development of an effective program of supervision will be emphasized.

361-765. Testing in Industrial Subjects Credit 3(3-0)
(Formerly I. Ed. 3595)

Study and application of principles of achievement test construction to shop and drawing subjects; evaluation of results.

- 361-766. Curriculum Laboratory in Industrial Education** Credit 3(3-0)
(Formerly I.Ed. 3596)

Principles and preparation of instructional materials for classroom use. Students select and develop some significant areas of instruction for use in a shop or related subject class. Courses of study that function in teaching situations are prepared. Opportunity offered to analyze existing courses of study.

- 361-767. Research and Literature in Industrial Education** Credit 3(3-0)
(Formerly 3597)

Research techniques applied to technical and educational papers and thesis; classification of research; selection, delineation and planning; collection, organization and interpretation of data; survey of industrial education literature.

- 361-768. Industrial Education Seminar** Credit 3(3-0)
(Formerly I.A. 3598)

Designed to enable non-thesis graduate majors to complete educational and technical investigations. Each student will be expected to plan and complete a research paper and present a summary of his findings to the seminar.

- 361-769. Thesis Research in Industrial Education** Credit 3
(Formerly I.Ed. 3599)

INDUSTRIAL TECHNOLOGY

Andrew Williams, Chairman

Office: Price 111

Advanced Undergraduate and Graduate

- 361-651. Power Industries and Technology** Credit 3(2-2)

Significance of modern power sources in Industrial Technology. Design and operating principles of steam, water hydraulic, pneumatic, internal and external combustion units. Nuclear, hydro-electric, gasoline, diesel, turbine rocket, jet, fuel cells, solar energy and other systems. Laboratory experiences involving utilization of power equipment, testing and servicing, with major emphasis on portable power plants.

- 361-673. Advanced General Metals I** Credit 3(2-2)
(Formerly 3573)

A course in metal work for teachers of industrial arts. Emphasis will center on art metal (including plating, finishes, etc.) advanced bench metal, sheet metal operations and machine shop. Specifications of equipment, organization of instruction sheets, special problems and material will be covered as well as shop organization. Prerequisite: 471 or equivalent.

- 361-674. Advanced General Metals II** Credit 3(2-2)
(Formerly 511)

Advanced course in metal work for the industrial arts teacher or other persons who may require more specialization in an area of metalwork. With the necessary prerequisites, the student may select any area of general metals for concentration and special study. Construction of projects, special assignments, etc. will be made after the area of work is selected and after consultation with the instructor. Prerequisite: 673.

For Graduate Students Only

- 361-735. Electricity-Electronics** Credit 3(2-2)
(Formerly I.A. 3585)

For teachers and prospective teachers of Industrial Arts. Emphasis placed on the selection and construction of projects useful in school shops, development of selected information. Theory and fundamentals of electricity and radio communication, selecting equipment and supplies, course organization and instructional materials.

MATHEMATICS

Wendell P. Jones, Chairman

Office: Merrick Hall M101

The Department of Mathematics offers two curricula leading to the Master of Science in Education. One is intended primarily for individuals preparing to teach mathematics in junior or senior high school. The second is intended for individuals preparing to teach mathematics in senior high school or junior college, or planning to continue with graduate studies leading to a doctorate in mathematics.

Requirements for Admission to a Degree Program

In addition to the general requirements specified in the description of the degree programs in Education, a student wishing to be accepted as a candidate for the Master's degree program in Education with a concentration in Mathematics must have earned thirty (30) semester hours in mathematics including differential and integral calculus and differential equations. A student who fails to meet these qualifications will be expected to satisfy the requirements by enrolling in undergraduate courses before beginning his graduate studies in mathematics.

Requirements for a Degree

A student may not receive credit for a course which is equivalent to one for which he has received an undergraduate grade of "C" or above.

JUNIOR HIGH-SENIOR HIGH CURRICULUM

Non-thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must satisfy the following:

1. At least one mathematics course numbered higher than 626.
2. 15 additional hours from the following: Mathematics 600, 601, 602, 603, 604, 607, 620, 623, 624, 700, 701, 710, 711, 715, 717, 720.
3. An elective of 3 semester hours in education or mathematics or courses related to mathematics.

Thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science in Education, the student must satisfy the following:

1. At least one mathematics course numbered higher than 626.
2. 15 additional semester hours in mathematics from the following: Mathematics 600, 601, 602, 603, 604, 607, 620, 623, 624, 700, 701, 710, 711, 715, 717, 720.
3. A thesis focused on research in mathematics or in the teaching of mathematics.
4. 3 hours of electives.

SENIOR HIGH-JUNIOR COLLEGE CURRICULUM

Non-thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general require-

ments for a Master of Science degree in Education, a student must complete the following:

1. 9 semester hours in mathematics courses numbered higher than 626.
2. 9 additional hours from the following: 600, 601, 602, 603, 604, 607, 620, 623, 624, 700, 701, 710, 711, 715, 717, 720.
3. An elective of 3 semester hours in education or mathematics or courses related to mathematics.

Thesis Option: 30 s.h. required.

In addition to the courses specified in the description of general requirements for a Master of Science degree in Education, a student must complete the following:

1. 9 semester hours in mathematics courses numbered higher than 626.
2. 9 additional hours from the following: Mathematics 600, 601, 603, 604, 607, 620, 623, 624, 700, 701, 711, 715, 717, 720.
3. A thesis requiring research on a problem in the field of mathematics.
4. 3 hours of electives.

Advanced Undergraduate and Graduate

225-600. Introduction the Modern Mathematics for Secondary School Teachers Credit 3(3-0)
(Formerly Mathematics 3670)

A study of the elementary theory of sets, elementary logic and postulational systems, the nature and methods of mathematical proofs, structure of the real number system. Open only to inservice teachers, or by permission of Department of Mathematics.

225-601. Algebraic Equations for Secondary Teachers
(Formerly Math. 3671)

Algebra of sets, solution sets for elementary equations, linear equations and linear systems of equations, matrices and determinants with applications to the solution of linear systems. Prerequisite: Math. 600.

225-602. Modern Algebra for Secondary School Teachers Credit 3(3-0)
(Formerly 3672)

Sets and mappings, properties of binary operations, groups rings, integral domains, vector spaces and fields. Prerequisite: Math. 600.

225-603. Modern Analysis for Secondary School Teachers Credit 3(3-0)
(Formerly 3673)

Properties of the real number system, functions, limits, sequences, continuity, differentiation and differentiability, integration and integrability. Prerequisite: Math. 600.

225-604. Modern Geometry for Secondary School Teachers Credit 3(3-0)
(Formerly 3674)

Re-examination of Euclidean geometry, axiomatic systems and Hilbert axioms, introduction to projective geometry, other non-Euclidean geometries. Prerequisite: Math. 600.

225-606. Mathematics for Chemists Credit 3(3-0)
(Formerly Math. 3676)

This course will review those principles of mathematics which are involved in chemical computations and derivations from general through physical chemistry. It will include a study of significant figures, methods of expressing large and small numbers, algebraic operations, trigonometric functions, and an introduction to calculus.

225-607. Theory of Numbers Credit 3(3-0)
(Formerly Math. 3677)

Divisibility properties of the integers. Euclidean algorithm, congruences, diophantine equations, number-theoretic functions, and continued fractions. Prerequisite: Twenty hours of college mathematics.

225-608. Mathematics of Life Insurance Credit 3(3-0)
(Formerly Math. 3678)

Probability, mortality tables, life insurance, annuities, endowments; computation of net premiums; evaluation of policies; construction and use of tables. Prerequisite: Math. 224.

225-620. Elements of Set Theory and Topology Credit 3(3-0)
(Formerly Math. 3682)

Operations on sets, relations, correspondences, comparison of sets, functions, ordered sets, general topological spaces, metric spaces, continuity, connectivity, compactness, homeomorphic spaces, general properties of T-spaces. Prerequisite: Math. 222.

225-623. Advanced Probability and Statistics Credit 3(3-0)
(Formerly Math. 3683)

Introduction to probability, distribution functions and moment-generating functions, frequency distribution of two variables, development of chi-square, students' "T" and "F" distributions. Prerequisite: Math. 222.

225-624. Method of Applied Statistics Credit 3(3-0)
(Formerly Math. 3684)

Presents the bases of various statistical procedures. Applications of normal, binomial, Poisson, Chi-square, students' "T" and "F" distributions. Tests of hypothesis, power of tests, statistical inference, regression and correlation analysis and analysis of variance. Prerequisite: Math. 224.

For Undergraduate Students Only

225-625. Modern Mathematics for Elementary School Teachers I Credit 3(3-0)
(Formerly Math. 3685)

A study of mathematic language, sets, relations, number systems, bases, structures, informal geometry, computation. No credit towards a degree in mathematics; not open to secondary school teachers of mathematics. Credit on el. ed. degree.

225-626. Modern Mathematics for Elementary School Teachers II Credit 3(3-0)
(Formerly 3686)

A continuation of Math. 725. Prerequisite: Math 725 (Formerly 3685). No credit towards a degree in mathematics; not open to secondary school teachers of mathematics. Credit on el. ed. degree.

For Graduate Students Only

225-700. Theory of Functions of a Real Variable I Credit 3(3-0)
(Formerly Math. 3690)

A study of point set theory, metric spaces, measurable sets, measurable functions, Lebesgue integral of a bounded function, L spaces. Prerequisite: Math. 508 and 620.

- 225-701. **Theory of Functions of a Real Variable II** Credit 3(3-0)
(Formerly Math. 3691)

Continuation of Mathematics 700.

- 225-710. **Theory of Functions of a Complex Variable I** Credit 3(3-0)
(Formerly Math. 3692)

A study of complex numbers, elementary functions, analytic functions, residue calculus, conformal mapping, Taylor and Laurent expansions. Prerequisite: Math. 508.

- 225-711. **Theory of Functions of a Complex Variable II** Credit 3(3-0)
(Formerly Math. 3693)

Continuation of Mathematics 710.

- 225-715. **Projective Geometry** Credit 3(3-0)
(Formerly Math. 3694)

A study of homogenous coordinates, linearly dependent points and lines, the principle of duality, harmonic points, harmonic lines, conics, projective and affine transformations. Prerequisites: Math. 601, 242, and 350.

- 225-717. **Special Topics in Algebra** Credit 3(3-0)
(Formerly Math. 3695)

A study of advanced topics in algebra which do not receive full development in the prerequisite courses. Prerequisite: Math. 512 or Math. 520.

- 225-720. **Special Topics in Analysis** Credit 3(3-0)
(Formerly Math. 3696)

A study of advanced topics in analysis.

- 225-730. **Thesis Research in Mathematics** Credit 3 s.h.
(Formerly 3699)

MUSIC

Jimmy J. Williams, Acting Chairman
Office: Frazier Hall

Courses for Advanced Undergraduate and Graduate

- 219-610. **Music in Elementary Schools Today** Credit 3(2-2)
(Formerly 2680)

The conceptual approach; the Orff and Kodaly methods.

- 219-614. **Choral Conducting of School Music Groups** Credit 2(2-4)
(Formerly 2682)

Girls and boys' glee clubs, mixed ensembles and mixed choirs.

- 219-616. **Instrumental Conducting of School Music Groups** Credit 2(0-4)
(Formerly 2683)

The skills of conducting with literature for beginners, intermediate, and advanced junior high and senior high school bands and orchestras.

- 219-618. **The Psychology of Music** Credit 3(3-0)
(Formerly 2684)

The use of psychology in the learning and teaching of music.

- 219-620. **Advanced Music Appreciation** Credit 3(2-2)
(Formerly 2685)

Emphasis on large music forms, including Bach's B Minor Mass and Six

Brandenburg Concertos, Mozart's Don Giovanni, Beethoven's Symphony No. IX, Schubert's Symphony in C Major and The Trout Quintet, Berlioz's Symphony Fantastique, Brahms's Symphony No. IV, Bizet's Carmen, Verdi's Aida, Wagner's Lohengrin, Debussy's Afternoon of a Faun, Bartok's Concerto for Orchestra, Berg's Wozzeck, Hindemith's Mathis der Maler, and others.

PHYSICS

Jason Gilchrist, Chairman

Office: 109 Cherry Hall

For Graduate Students Only

- 227-705. General Physics for Science Teachers I** Credit 3(2-2)
(Formerly Physics 3885)

For persons engaged in teaching. Includes two hours of lecture demonstration and one two-hour laboratory period per week. Emphasis is placed upon understanding the basic principles of physics. Both courses may be combined during a single semester for double credit. For teachers only. Prerequisite: College degree.

- 227-706. General Physics for Science Teachers II** Credit 3(2-2)
(Formerly Physics 3886)

A continuation of Physics 705.

- 227-707. Electricity for Science Teachers** Credit 2(2-0)
(Formerly Physics 3887)

Includes electric fields potentials, direct current circuits, chemical and thermal emf's electric meters and alternating currents. For teachers. Prerequisite: College Physics.

- 227-708. Modern Physics for Science Teachers I** Credit 2(2-0)
(Formerly Physics 3888)

An introductory course covering the usual areas of modern physics. Both courses may be combined during a single semester for double credit. For teachers only. Prerequisite: College Physics.

- 227-709. Modern Physics for Science Teachers II** Credit 2(2-0)
(Formerly Physics 3880)

A continuation of Physics 708.

PLANT SCIENCE AND TECHNOLOGY

Samuel J. Dunn, Chairman

Office: 235 Carver Hall

For Advanced Undergraduates and Graduates

AGRICULTURAL ENGINEERING

- 130-601. Advanced Farm Shop** Credit 3(1-4)
(Formerly Ag. Engr. 1476)

Study of the care, operation, and maintenance of farm shop power equipment. Prerequisite: Ag. Engr. 114.

- 130-602. Special Problems in Agricultural Engineering** Credit 3(0-6)
(Formerly Ag. Engr. 1477)

Special work in agricultural engineering on problems of special interest to the student. Open to seniors in Agricultural Engineering.

CROP SCIENCE

- 130-603. Plant Chemicals** Credit 3(2-2)
(Formerly Crop Science 1478)

A study of the important chemical pesticides and growth regulators used in the production of economic plants. Prerequisites: Chem. 102 and Pl. Sc. 300.

- 130-604. Crop Ecology** Credit 3(3-0)
(Formerly Crop Science 1479)

Study of the physical environment and its influence on crops; geographical distribution of crops.

- 130-605. Breeding of Crop Plants** Credit 3(2-2)
(Formerly Crop Science 1480)

Significance of crop improvements in the maintenance of crop yields; application of genetic principles and techniques used in the improvement of crops; the place of seed certification in the maintenance of varietal purity.

- 130-606. Special Problems in Crops** Credit 3(3-0)
(Formerly Crop Science 1481)

Designed for students who desire to study special problems in crops. By consent of instructor.

- 130-607. Research Design and Analysis** Credit 3(2-2)
(Formerly Crop Science 1482)

Experimental designs, methods and techniques of experimentation; application of experimental design to plant and animal research; interpretation of experimental data. Prerequisite: Ag. Econ. 644 or Math. 224.

HORTICULTURE

- 130-608. Special Problems** Credit 3(3-0)
(Formerly Hort. 1483)

Work among special lines given largely by the project method for advanced undergraduate and graduate students who have the necessary preparation.

- 130-610. Commercial Greenhouse** Credit 3(2-2)
(Formerly 1449)

Culture of floriculture crops in the greenhouse and out-of-doors with emphasis on cut flowers and outside bedding plants. Special attention given to seasonal production. Prerequisite: Hort. 334.

- 130-611. Commercial Greenhouse Production** Credit 3(2-2)
(Formerly 1450)

Culture of floriculture crops in the greenhouse with emphasis on pot plants and conservatory plants. Special attention given to seasonal production. Prerequisite: Hort. 334.

- 130-612. Plant Materials and Landscape Maintenance** Credit 3(2-2)
(Formerly 1425)

Identification, merits, adaptability, and maintenance of shrubs, trees, and vines used in landscape planting trees, shrubs, bulbs, and perennials. Prerequisite: Hort. 334, 335.

- 130-613. Plant Materials and Planning Design Credit** Credit 3(2-2)
(Formerly 1453)

Continuation of Horticulture 612 with added emphasis on plant combinations and use of plants as design elements. Prerequisite: Hort. 612.

SOIL SCIENCE

- 130-609. Special Problems in Soils** Credit 3(3-0)
(Formerly Soil Sci. 1484)

Research problems in soil for advanced students. By consent of instructor.

For Graduate Students Only

AGRICULTURAL ENGINEERING

- 130-700. Rural Electrification for Vocational Agricultural Teachers** Credit 3(3-0)
(Formerly 1489)

Rural electrification for vocational teachers. A study of electricity with particular emphasis on its application to the home and farm.

CROP SCIENCE

- 130-702. Grass Land Ecology** Credit 2(2-0)
(Formerly 1491)

The use of grasses and legumes in a dynamic approach to the theory and practice of grass-land agriculture, dealing with the fundamental ecological principles and their application to management practices.

EARTH SCIENCE

- 130-703. Topics in Earth Science** Credit 2(2-0)
(Formerly 1492)

A discussion of special topics from astronomy, geology, soil genesis, meteorology, oceanography, and physical geography.

- 130-704. Problem Solving in Earth Science** Credit 3(0-6)
(Formerly 1493)

A laboratory-demonstration course involving identification of earth materials, measurements in environmental processes, and field observation of natural physical phenomena.

- 130-705. The Physical Universe** Credit 3(3-0)
(Formerly Earth Sc. 1494)

This course is designed to give the student a broad general background knowledge of the earth's physical environment; its lithosphere, hydrosphere and atmosphere and their interaction on weather and climate. The physical nature of the stars, the sun, and planets will also be studied in the light of modern concepts of space.

- 130-706. Physical Geology** Credit 3(3-0)
(Formerly Earth Sc. 1495)

The development of the earth's surface, its material composition and forces acting upon its surface will be considered. Specific topics include origin of mountains and volcanos, causes of earthquake, work of rivers, wind, waves, and glaciers. Prerequisite: Ea. Sci. 705 or consent of instructor.

- 130-708. Conservation of Natural Resources** Credit 3(3-0)
(Formerly Earth Sc. 1496)

A descriptive course dealing with conservation and development of renewable natural resources encompassing soil, water, and air; cropland, grassland and forests; livestock, fish, and wildlife; and recreational, aesthetic and scenic values. Attention will be given to protection and development of the nation's

renewable natural resources base as an essential part of the national security, defense, and welfare.

- 130-709. Seminar in Earth Science** Credit 2(2-0)
(Formerly 1497)

A seminar concerned with recent developments in the earth sciences and related disciplines.

SOIL SCIENCE

- 130-710. Soils of North Carolina** Credit 3(2-2)
(Formerly Soils 1498)

A study of the factors basic to the understanding of the soils of North Carolina, their classification and properties as related to sound land-use and management.

POLITICAL SCIENCE

Virgil C. Stroud, Chairman
Office: 308 Hodgin Hall

POLITICAL SCIENCE

For Advanced Undergraduates and Graduates

- 237-640. Federal Government** Credit 3(3-0)
(Formerly Pol. Sc. 2976)

After a brief review of the structure and functions of the federal government, this course concerns itself with special areas of federal government: problems of national defense, the government as a promoter, the government as regulator, etc. Students will engage in in-depth study in one of the specific areas under consideration.

- 237-641. State Government** Credit 3(3-0)
(Formerly Pol. Sc. 2977)

An in-depth study of special problems connected with operations of state and local governments.

- 237-642. Modern Political Theory** Credit 3(3-0)
(Formerly Pol. Sc. 5973)

Includes selected political works for adherence to modern conceptions of the state, political institutions as well as the works of Machiavelli, Hobbes, Spinoza, Rousseau, Burke, Mill, Hegel, Marx, and Dewey.

- 237-643. Urban Politics and Government** Credit 3(3-0)
(Formerly Pol. Sc. 5975)

A detailed analysis of the urban political arena including political machinery, economic forces and political structures of local governmental units.

- 237-645. American Foreign Policy—1945 to Present** Credit 3(3-0)
(Formerly Pol. Sc. 2976)

Examination of forces and policies that have emerged from Potsdam, Yalta, and World War II. Emphasis will be on understanding the policies that were formulated, how they were formulated, why they were formulated, the consequences of their formulation, and the alternative policies that may have come about. Prerequisites: Survey course in American history, American Diplomatic History, and consent of instructor. Enrollment limit of 15 students.

- 237-646. The Politics of Developing Nations** Credit 3(3-0)
(Formerly Pol. Sc. 5974)

Political structures and administrative practices of selected countries in Africa, Latin America, Asia. Analysis of particular cultural, social and economic variable peculiar to the nations.

For Graduate Students Only

- 237-730. Constitutional Development Since 1865** Credit 3(3-0)
(Formerly His. 2896)

Historical study of the development of the Constitution since 1865. Treatment will be given to important Constitutional decisions, major documents, major Supreme Court decisions, and public policy. Assignments in paperback books will be frequent.

- 237-740. Government Finance** Credit 3(3-0)
(Formerly Pol. Sc. 2898)

A study at the graduate level of government finances. It will cover (a) the pattern and methods of taxation, from a direct poll tax to a withholding system; (b) the use of revenues, from "funding the debt" to foreign aid. A parallel study of local and state financial systems will be made. The political implications of government finances will be considered. The course will also consider a newer concept of government finances, "taxes as an investment." Intensive readings and reports required.

- 237-741. Comparative Government** Credit 3(3-0)
(Formerly Pol. Sc. 2899)

Comparative analysis of the American system of government and selected foreign governments. Administration, organization, and processes in these systems of government will also be considered.

- 237-742. Research and Current Problems** Credit 3(3-0)
(Formerly Pol. Sc. 2990)

Considered are fundamental concepts of scientific method of research; effective research procedures; techniques and sources used in research about government; investigation of some current and recurrent problems inherent in Federalism and "State Rights," individualism and collective action, free enterprise and governmental regulations.

- 237-743. Readings in Political Science** Credit 3(3-0)
(Formerly Pol. Sc. 5985)

Selected subjects arranged by student and teacher. It may include preliminary research in political theory or philosophy.

PSYCHOLOGY AND GUIDANCE

Office: 209 Hodgin Hall

The Department of Psychology and Guidance offers a program leading to a Master of Science in Education with concentration in Counselor Education (Guidance). Requirements for admission to the program and for the degree are listed earlier in this bulletin.

For Advanced Undergraduates and Graduates

GUIDANCE

- 320-600. Introduction to Guidance** Credit 3(3-0)
(Formerly 2378)

A foundation course for prospective teachers, part-time or full-time counselors who plan to do further work in the field of guidance or of education.

Special consideration will be given to the nature, scope, and principles of guidance services. No credit toward a concentration in guidance.

PSYCHOLOGY

- 320-623. Personality Development** Credit 3(3-0)
(Formerly 2023)

A study of the basic processes in personality development, the contents of personality, and the consequences of personality development.

- 320-661. Psychology of the Exceptional Child** Credit 3(3-0)

An analysis of psychological factors affecting identification and development of mentally retarded children, physically handicapped children, and emotionally and socially maladjusted children.

- 320-662. Mental Deficiency** Credit 3(3-0)

A survey of types and characteristics of mental defectives; classification and diagnoses; criteria for institutional placement and social control of mental deficiency.

For Graduate Students Only

GUIDANCE

- 320-705. Guidance Practicum** Credit 3(1-4)
(Formerly 2385)

Practice in the job of the high school counselor with students of high school age. Primary emphasis will be placed on counseling, but all phases of the work of the counselor will be covered. Students enrolled in this course should have completed major courses in their program and should have demonstrated skills in techniques, principles, and practices in the field. (Permission must be granted by Counselor-Educator.)

- 320-706. Organization and Administration of Guidance Services** Credit 2(2-0)
(Formerly 2386)

A study of methods by which guidance policies and services may be properly implemented through organizational framework; consequently, leads to more effective organization of current guidance programs.

- 320-707. Research Seminar** Credit 3(1-4)
(Formerly 2387)

Critical discussions of research projects in progress and of the related literature to such projects. An acceptable written report is required. The course recommended for guidance majors in the degree program and others seeking the School Counselor's certificate. Prerequisite: Guidance 705, prior or concurrent.

- 320-714. Internship in Guidance** Credit 3(1-4)

The Internship will be concerned with experiences involved in the organization and operation of the many and varied public school programs and their interaction with community agencies. An extended period of continuous full-time experience must be completed by students who have not had previous teaching experience. (Permission must be granted by Counselor-Educator.)

- 320-715. Measurement for Guidance** Credit 3(2-2)
(Formerly 2395)

The development of understandings and skills in collecting and interpreting data concerning the individual, and the use of such data in case studies and follow-up procedures.

- 320-716. Techniques of Individual Analysis** Credit 2(2-0)
(Formerly 2396)

A study of educational and vocational testing with reference to a general framework for using statistical information in several types of counseling problems. Statistics necessary for the evaluation of psychological and educational measurement will be considered. This course also includes the measurement of aptitude, including special aptitude, with reference to prediction of proficiency in various occupations and curricula.

- 320-717. Educational and Occupational Information** Credit 3(3-0)
(Formerly 2397)

Sources and procedures of assembling information about occupations and educations; methods of using collected information.

- 320-718. Introduction to Counseling** Credit 3(3-0)
(Formerly 2398)

Information regarding the background and theories of counseling. Consideration will be given to the counselor's function, counseling interview, use of records, and the school counselor's place in a total personnel program.

- 320-719. Case Studies in Counseling** Credit 2(1-2)
(Formerly 2399)

The development of a basic understanding of the case study technique as used in counseling. Compilation, analysis, diagnosis and treatment of theoretical and actual counseling case histories.

PSYCHOLOGY

- 320-726. Educational Psychology** Credit 3(3-0)
(Formerly 2096)

A study of the applications of psychological principles to educational practices.

- 320-727. Child Growth and Development** Credit 3(3-0)
(Formerly 2097)

A comprehensive analysis of physical, mental, emotional, and social growth and development from birth through adolescence.

- 320-728. Measurement and Evaluation** Credit 3(2-2)
(Formerly 2098)

A consideration of measurement techniques and interpretation of group tests and individual pupil diagnostic tests.

- 320-729. Mental Hygiene for Teachers** Credit 3(3-0)
(Formerly 2099)

An analysis of the functions of mental hygiene in the total educative process. Attention is given to the basic principles of mental health as these apply to pupils and teachers alike; to the types of adjustment; to the development of personality; and to psychotherapeutic techniques for the restoration of mental health. Prerequisite: Psychology 726.

SPEECH AND DRAMA Office: 304 Communications Building

For Advanced Undergraduates and Graduate Students

- 215-620. Community and Creative Dramatics** Credit 3(3-0)
(Formerly English 2470)

An introduction to basic elements and techniques of play production: acting, direction, stagecraft, lighting, costuming, play selection.

215-630. Voice and Speech for Teachers
(Formerly English 2473)

Credit 2(1-2)

A course designed to provide a review of the fundamental skills of oral communication and instruction in public speaking. Not accepted for credit towards undergraduate or graduate concentration in English.

SOCIOLOGY AND SOCIAL SERVICE

Will B. Scott, Chairman
Office: 251 Carver Hall

Advanced Undergraduates and Graduates

SOCIOLOGY

235-699. Small Groups

Credit 3(3-0)

Elements and characteristics of small group behavior and process. Prerequisite: Senior and graduate standing; permission of instructor.

235-670. Law and Society

Credit 3(3-0)

This course examines selected and representative forms of social justice and injustices; barriers and opportunities for legal redress, as related to contemporary issues. Prerequisite: Senior or graduate standing.

235-671. Advanced Research Methods

Credit 3(3-0)

Continuation of Sociology 403. Prerequisite: Senior or graduate standing; minimum of 6-9 credits in statistics and/or research.

